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The carrier assembly 130 may comprise any suitable components and features as described herein with respect to the first embodiment 100, and will suitably function to mechanically engage the locking structure 220 as described herein.

A spring or other biasing means (not shown) may be provided to urge the structure 220 in a rearward direction (as indicated by the Rearward arrow on the figures). For example and not by way of limitation, a helical compression spring may be provided pushing the structure 220 in the rearward direction, for example.

Once the trigger 210 is actuated by movement 114 between firing and non-firing positions and a cartridge is fired, the action of the firearm begins to cycle causing the carrier assembly 130 to move rearward as depicted in FIG. 2C. This moves the engagement feature 132 away from the locking structure 220, allowing the spring or other urging means discussed above but not shown to cause the locking structure 220 to automatically translate linearly in the rearward direction, such that when the trigger 210 is moved 114 between firing and non-firing positions, for instance when it is released, a lower portion 222 of the locking structure 220 automatically engages an engagement feature 211 of the trigger 210 at a locking interface 224 and locks the trigger 210 in position as shown in FIGS. 2C and 2D, thereby restricting movement 114 of the trigger 210 between firing and non-firing positions while the action of the firearm is out-of-battery.

FIG. 2D shows the example embodiment 200 discussed above with respect to FIG. 2C with the carrier assembly 130 returning longitudinally forward in the direction of the arrows and the engagement feature 132 of the carrier assembly 130 re-contacting the locking structure 220 as the action of the firearm continues to cycle after the firing of a cartridge.

FIG. 2E shows the example embodiment 200 discussed above with respect to FIG. 2D with the carrier assembly 130 having fully returned longitudinally forward in the direction of the arrows when the action of the firearm is in an in-battery position ready to fire a second cartridge. The engagement feature 132 of the carrier assembly 130 has pushed forward the locking structure 220, causing the locking structure 220 to move linearly forwards against whatever spring forces may be urging the locking structure 220 in the rearward direction, and the firearm and its components are in the same positions and states as they were at the beginning of the process as shown and described with respect to FIG. 2A, namely with the trigger 210 automatically unlocked and free to move 114 as shown in FIG. 2B once the action of the firearm returns to in-battery position. This sequence can be repeated any number of times with any number of cartridges.

FIGS. 3A, 3B, and 4 illustrate a third example embodiment 300 of a trigger-locking apparatus, system, and method for semiautomatic firearms that have an action that cycles by loading, firing, and extracting cartridges when the firearm is repeatedly fired by movements of the trigger 310. This example embodiment 300 illustrates certain components of a trigger assembly that is capable of firing on both pull-and-release, and comprises a third example locking structure 320 that when in an unlocked position shown in FIGS. 3A, 3B, allows movement of the trigger 310 between non-firing and firing positions, and when in a locked position shown in FIG. 4, restricts movement of the trigger 310 between firing and non-firing positions. The third example embodiment 300 includes a hammer 340 that is releasably engaged by the trigger 310 and by a secondary disconnect member 350.

FIGS. 3A and 3B show the third example embodiment 300 with the third example locking structure 320 rotated about an axis 322 to an unlocked position by a carrier assembly 330 that is translated longitudinally forward (as shown by the arrow labeled Forward in the figures) when the action of the firearm is in an in-battery position ready to fire a cartridge. More specifically, an engagement feature 332 on the carrier assembly 330 is in a forward position having pushed forward a top portion of the locking structure 320, causing the locking structure 320 to rotate clockwise about its pivotal axis 322. In this unlocked position, the third example locking structure 320 clears the trigger 310, so that the trigger 310 may be actuated and rotated about its pivotal axis 112. Also in this unlocked position, the third example locking structure 320 is not engaging the secondary disconnect member 350 and has allowed the secondary disconnect member 350 to move to an engagement position 354 where it can engage with a corresponding hook on the hammer 340 when the hammer 340 is rotated further counterclockwise (for instance as shown in FIG. 4).

FIG. 4 shows the third example embodiment 300 with the third example locking structure 320 rotated counterclockwise about its axis 322 to a locked position, as when the carrier assembly 330 of FIG. 3A (not shown in FIG. 4) is translated longitudinally rearward, for instance when the action of the firearm is being cycled during the firing of a cartridge. More specifically, in FIG. 4 an engagement feature 332 on the carrier assembly 330 would now be in a rearward position, like carrier assembly 130 in FIG. 1C, and would no longer be pushing forward on a top portion of the locking structure 320, thereby allowing the locking structure 320 to automatically rotate counter-clockwise about its pivotal axis 322 (under the rotational force of an urging mechanism like a spring as discussed with regarding to embodiment 100). In this locked position, the third example locking structure 320 forms a locking interface 324 with the trigger assembly 310, so that the trigger 310 may not be actuated and rotated about its pivotal axis 112, thereby locking the trigger 310 when the action of the firearm is out-of-battery. Also in this locked position, the third example locking structure 320 engages the secondary disconnect member 350 and pulls it rearward to a disengagement position 356 where it will not engage with the corresponding hook on the hammer 340. This ensures that the secondary disconnect member 350, also sometimes referred to as an anti-hammer-follow disconnect, does not engage out of sequence.

As the action of the firearm returns to battery and the carrier assembly 330 moves back to its forward position, the above embodiment 300 will return to the state shown in FIG. 3A, with the trigger 310 unlocked and the secondary disconnect member 350 back in position 354 to engage the hammer 340. This sequence can be repeated any number of times with any number of cartridges.

It is understood that the above-described embodiments are merely illustrative of the application. Other embodiments may be readily devised by those skilled in the art, which may embody one or more aspects or principles of the invention and fall within the scope of the claims. For example, it is contemplated that the present principles could be employed with many other locking mechanisms other than those disclosed as locking structures 120, 220, 320, such as plunger designs, rotating cams, gears, or ratchets, or any other suitable structure that achieves the present purposes. Any suitable materials and manufacturing methods may be used as would be apparent to persons of skill in the art.

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What is claimed is:

1. A trigger-locking apparatus for a semi-automatic firearm having a trigger and an action that cycles by a carrier assembly element translating longitudinally and the action loading, firing, and extracting cartridges when the firearm is repeatedly fired by movements of the trigger, the trigger-locking apparatus comprising:

a structure that when in a first position allows movement of the trigger between firing and non-firing positions, and when in a second position restricts movement of the trigger between firing and non-firing positions; the trigger-locking apparatus configured so that, when it is installed in the semi-automatic firearm, the structure is configured to:

be held in the first position by contact with the carrier assembly element when the action of the firearm is in an in-battery position ready to fire a first cartridge; be released from contact with the carrier assembly element and, only upon release of the trigger, move to the second position when the firearm is firing the first cartridge and the action is being cycled; then

be returned to the first position by contact with the carrier assembly element as the action of the firearm cycles back to the in-battery position ready to fire a second cartridge.

2. The trigger-locking apparatus of claim 1, wherein the trigger-locking apparatus is further configured so that, when it is installed in the semi-automatic firearm, the structure is configured to:

be released from contact with the carrier assembly element and, only upon release of the trigger, move to the second position when the firearm is firing the second cartridge and the action is being cycled; then

be returned to the first position by contact with the carrier assembly element as the action of the firearm cycles back to the in-battery position ready to fire a third cartridge.

3. The trigger-locking apparatus of claim 1, wherein the structure is biased toward the second position by a spring.

4. The trigger-locking apparatus of claim 1, wherein the structure is configured to move between the first and second positions by pivoting about an axis.

5. The trigger-locking apparatus of claim 1, wherein the structure is configured to move between the first and second positions by translating linearly.

6. The trigger-locking apparatus of claim 1, wherein the carrier assembly element comprises any of a carrier or a bolt that engages and moves the structure from the first position to the second position when the carrier assembly element translates longitudinally when the action is cycled.

7. The trigger-locking apparatus of claim 1, wherein the action of the semi automatic firearm carrier assembly element comprises a slide that is configured to translate longitudinally when the action is cycled, and the structure is configured to be moved from the first position to the second position by longitudinal movement of the slide.

8. The trigger-locking apparatus of claim 1, for a semi-automatic firearm having a hammer that is releasably engaged by the trigger and by a secondary disconnector member, wherein the structure is further configured to move the secondary disconnector member from a position where it can engage the trigger to a position where it cannot engage the trigger when the structure is moved from the first position to the second position.

9. The trigger-locking apparatus of claim 8, wherein the structure is further configured to allow the secondary disconnector member to move from a position where it cannot

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engage the trigger to a position where it can engage the trigger when the structure is moved from the second position to the first position.

10. A semi-automatic firearm having a trigger, a trigger-locking apparatus, and an action that cycles by a carrier assembly element translating longitudinally and the action loading, firing, and extracting cartridges when the firearm is repeatedly fired by movements of the trigger, the trigger-locking apparatus comprising:

a structure that when in a first position allows movement of the trigger between firing and non-firing positions, and when in a second position restricts movement of the trigger between firing and non-firing positions; the trigger-locking apparatus configured so that, when it is installed in the semi-automatic firearm, the structure is configured to:

be held in the first position by contact with the carrier assembly element when the action of the firearm is in an in-battery position ready to fire a first cartridge; be released from contact with the carrier assembly element and, only upon release of the trigger, move to the second position when the firearm is firing the first cartridge and the action is being cycled; then

be returned to the first position by contact with the carrier assembly element as the action of the firearm cycles back to the in-battery position ready to fire a second cartridge.

11. The semi-automatic firearm of claim 10, wherein the structure is further configured to:

be released from contact with the carrier assembly element and, only upon release of the trigger, move to the second position when the firearm is firing the second cartridge and the action is being cycled; then

be returned to the first position by contact with the carrier assembly element as the action of the firearm cycles back to the in-battery position ready to fire a third cartridge.

12. The semi-automatic firearm of claim 10, wherein the structure is biased toward the second position by a spring.

13. The semi-automatic firearm of claim 10, wherein the structure is configured to move between the first and second positions by pivoting about an axis.

14. The semi-automatic firearm of claim 10, wherein the carrier assembly element comprises a slide that is configured to translate longitudinally when the action is cycled, and the structure is configured to be moved from the first position to the second position by longitudinal movement of the slide.

15. The semi-automatic firearm of claim 10, further comprising a hammer that is releasably engaged by the trigger and by a secondary disconnector member, wherein the structure is further configured to move the secondary disconnector member from a position where it can engage the trigger to a position where it cannot engage the trigger when the structure is moved from the first position to the second position.

16. The semi-automatic firearm of claim 15, wherein the structure is further configured to allow the secondary disconnector member to move from a position where it cannot engage the trigger to a position where it can engage the trigger when the structure is moved from the second position to the first position.

17. A method of operating a semi-automatic firearm, comprising the steps of:

providing the semi-automatic firearm of claim 10;

moving the trigger and firing the first cartridge and then releasing the trigger, thereby causing the action to cycle and the structure to move from the first position into the

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second position thereby causing the trigger-locking apparatus to lock the trigger, and as the action of the firearm cycles back to the in-battery position ready to fire the second cartridge, causing the structure to move from the second position back to the first position 5 thereby causing the trigger-locking apparatus to unlock the trigger.

18. The method of claim 17, wherein the semi-automatic firearm further comprises a hammer that is releasably engaged by the trigger and by a secondary disconnecter 10 member, and wherein the structure is further configured to release the secondary disconnecter member from engagement with the trigger when the structure is moved from the first position to the second position, and to move the secondary disconnecter member to an engagement position 15 to engage with the trigger when the structure is moved from the second position to the first position, the method further comprising the steps of:

causing the structure to release the secondary disconnecter member from engagement with the trigger by 20 causing the structure to move from the first position to the second position; and

causing the structure to move the secondary disconnecter member to an engagement position to engage with the trigger by causing the structure to move from the 25 second position to the first position.

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Rounds**

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(45) **Date of Patent:** **Dec. 24, 2019**

(54) **FIREARM TRIGGER MECHANISM**

(71) Applicant: [REDACTED] Buda, TX (US)

(72) Inventor: **Jeffrey Cooper Rounds**, Buda, TX (US)

(73) Assignee: [REDACTED] Buda, TX (US)

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F41A 19/10 (2006.01)
F41A 19/12 (2006.01)
F41A 17/82 (2006.01)

(52) **U.S. Cl.**

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(58) **Field of Classification Search**

CPC F41A 19/10; F41A 19/12; F41A 19/14; F41A 19/43; F41A 17/82
USPC 89/136, 139; 42/69.01, 69.02, 69.03
See application file for complete search history.

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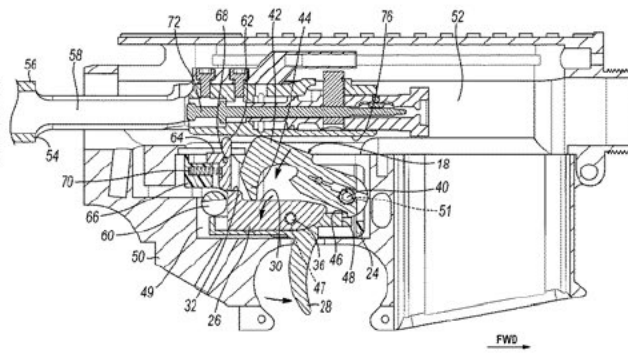
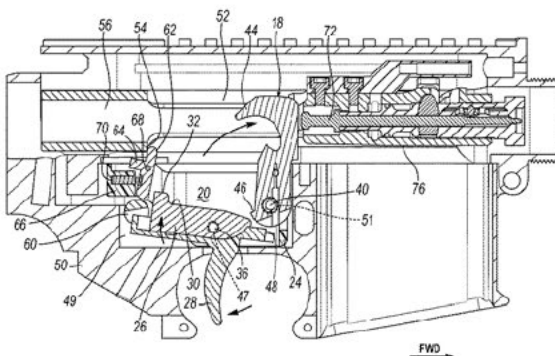
Primary Examiner — Bret Hayes

(74) *Attorney, Agent, or Firm* — Wood Herron & Evans LLP

(57) **ABSTRACT**

A trigger mechanism for use in a firearm having a receiver with a fire control mechanism pocket, transversely aligned pairs of hammer and trigger pin openings in the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled. The trigger mechanism includes a hammer, a trigger member, and a locking bar. The hammer has a sear notch and is mounted in the fire control mechanism pocket to pivot on a transverse hammer pin between set and released positions. The trigger member has a sear and is mounted in the fire control mechanism pocket to pivot on a transverse trigger pin between set and released positions. The trigger member has a surface positioned to be contacted by hammer when the hammer is displaced by cycling of the bolt carrier, the contact causing the trigger member to be forced to the set position. The locking bar is pivotally mounted in a frame and spring biased toward a first position in which it mechanically blocks the trigger member from moving to the release position, and is movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to the released position.

7 Claims, 4 Drawing Sheets



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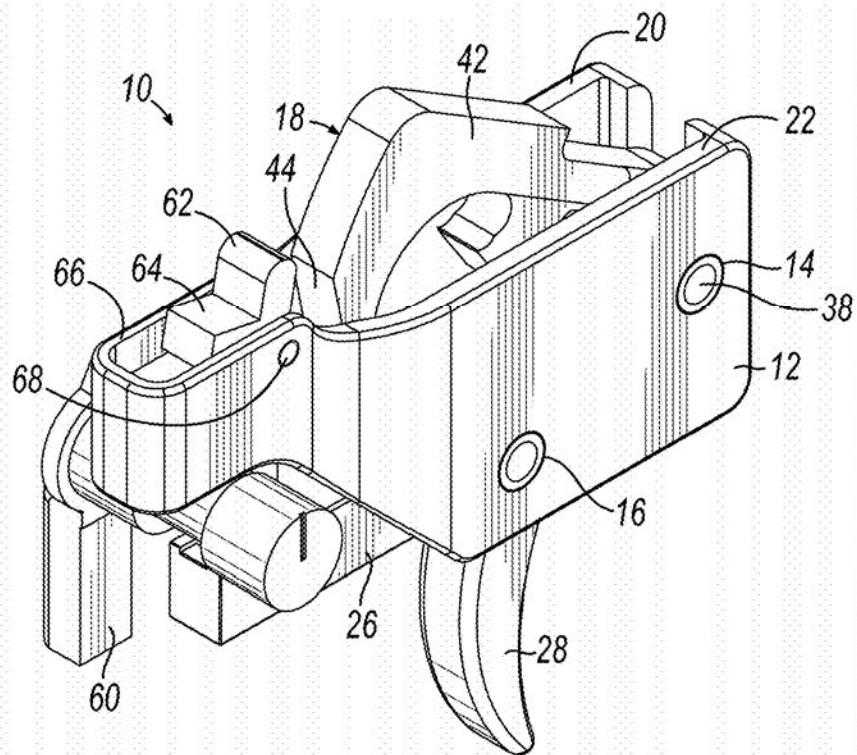


FIG. 1

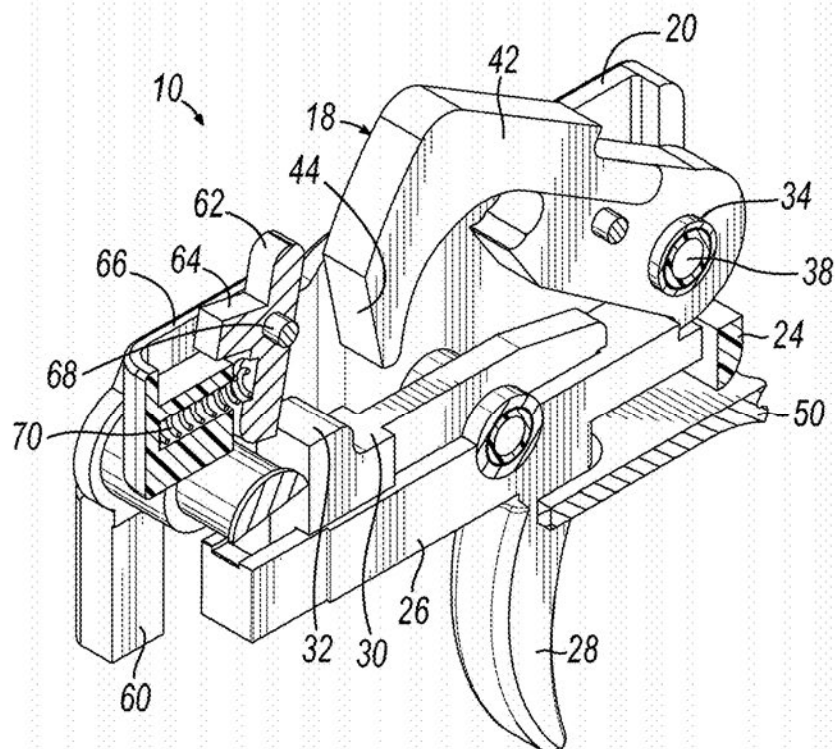


FIG. 2

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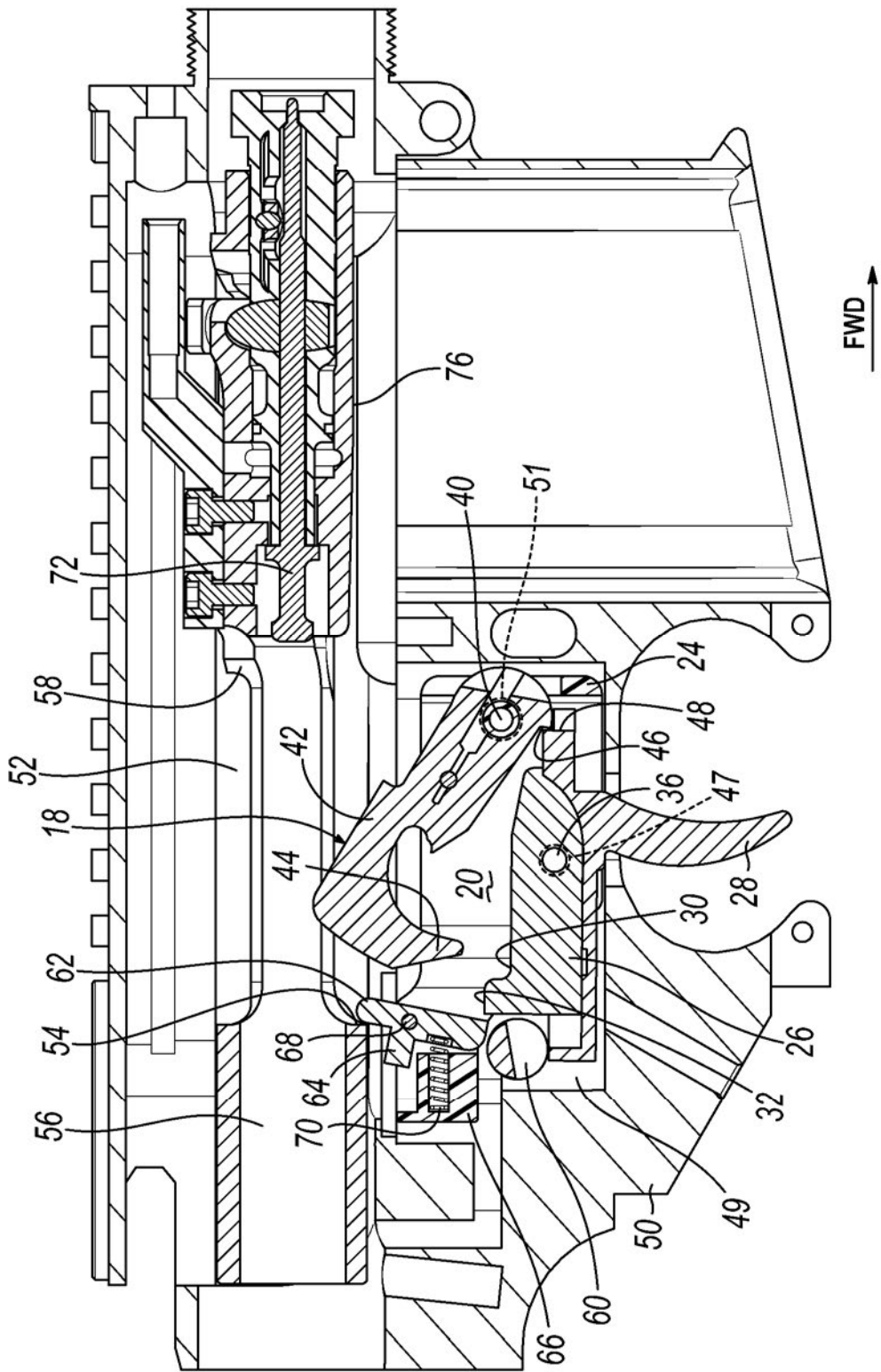


FIG. 3

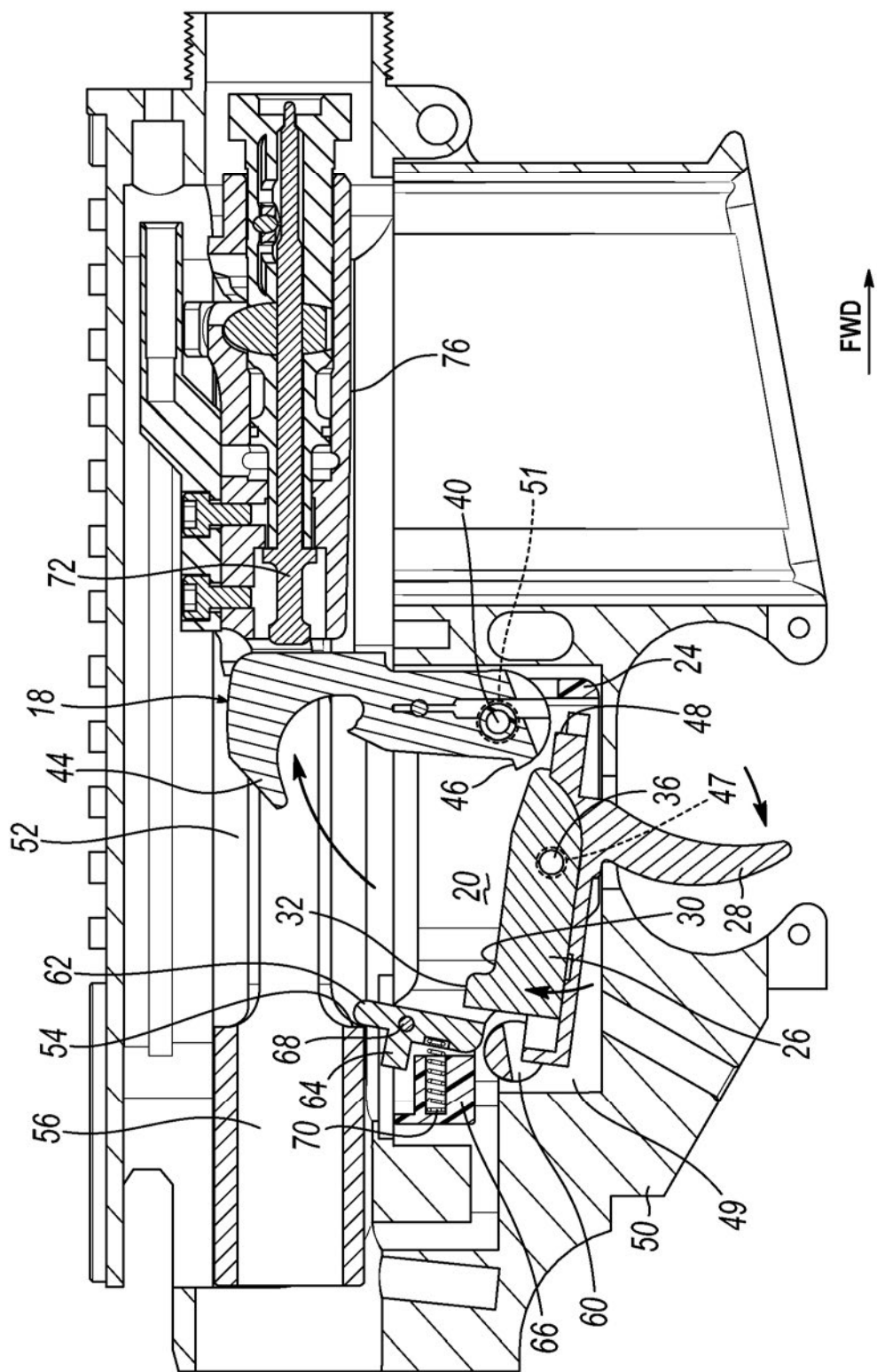


FIG. 4

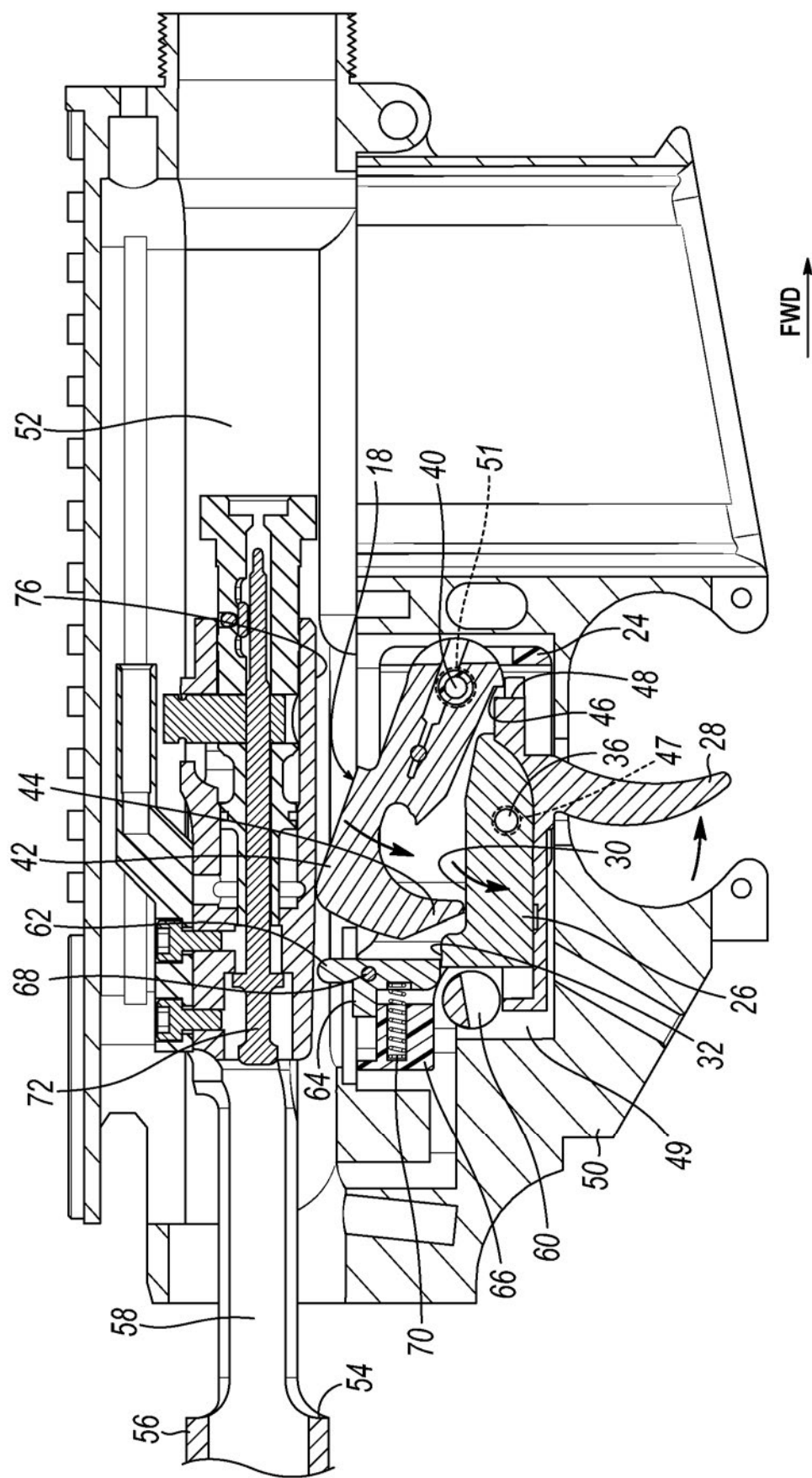


FIG. 5

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FIREARM TRIGGER MECHANISM**RELATED APPLICATIONS**

This application claims priority to U.S. Provisional Patent Application No. 62/565,247 filed Sep. 29, 2017, and incorporates the same herein by reference.

TECHNICAL FIELD

This invention relates to a firearm trigger mechanism. More particularly, it relates to a semiautomatic trigger that is mechanically reset by movement of the hammer when it is reset by the bolt carrier.

BACKGROUND

In a standard semiautomatic firearm, actuation of the trigger releases a sear, allowing a hammer or striker to fire a chambered ammunition cartridge. Part of the ammunitions propellant force is used to cycle the action, extracting and ejecting a spent cartridge and replacing it with a loaded cartridge. The cycle includes longitudinal reciprocation of a bolt and/or carrier, which also resets the hammer or striker.

A standard semiautomatic trigger mechanism includes a disconnecter, which holds the hammer or striker in a cocked position until the trigger member is reset to engage the sear. This allows the firearm to be fired only a single time when the trigger is pulled and held, because the user is not typically able to release the trigger rapidly enough so that the sear engages before the bolt or bolt carrier returns to its in-battery position. The disconnecter prevents the firearm from either firing multiple rounds on a single pull of the trigger, or from allowing the hammer or striker to simply “follow” the bolt as it returns to battery without firing a second round, but leaving the hammer or striker uncocked.

For various reasons, shooters desire to increase the rate of semiautomatic fire. Sometimes this is simply for entertainment and the feeling of shooting a machine gun. In the past, users have been known to employ “bump firing” to achieve rapid semiautomatic fire. Bump firing uses the recoil of the semiautomatic firearm to fire shots in rapid succession. The process involves bracing the rifle with the non-trigger hand, loosening the grip of the trigger hand (but leaving the trigger finger in its normal position in front of the trigger), and pushing the rifle forward in order to apply pressure on the trigger from the finger while keeping the trigger finger stationary. When fired with the trigger finger held stationary, the firearm will recoil to the rear and allow the trigger to reset as it normally does. When the non-trigger hand pulls the firearm away from the body and back forward toward the original position, it causes the trigger to be pressed against the stationary finger again, firing another round as the trigger is pushed back.

Other devices have been offered that facilitate the bump fire process. One is shown in U.S. Pat. No. 6,101,918, issued Aug. 15, 2000, to William Akins for a Method and Apparatus for Accelerating the Cyclic Firing Rate of a Semiautomatic Firearm. This device, sold for some time as the Akins Accelerator™, allowed the receiver and action of the firearm to move longitudinally relative to the butt stock and used a spring to assist forward return movement. Other devices, such as that shown in U.S. Pat. No. 8,127,658, issued Mar. 6, 2012, and other patents owned by Slide Fire Solutions provide a replacement stock and handgrip assembly that facilitates bump firing, but without spring assistance.

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Other solutions to increase the rate of semiautomatic fire include pull/release trigger mechanisms. These devices cause one round to be fired when the trigger is pulled and a second round to be fired when the trigger is released. Such a device is shown in U.S. Pat. No. 8,820,211, issued Sep. 2, 2014, entitled Selectable Dual Mode Trigger for Semiautomatic Firearms. A device like this is offered by FosTech Outdoors, LLC as the ECHO TRIGGER™. Another device, offered by Digital Trigger Technologies, LLC under the name DigiTrigger™, provides a dual mode trigger in which the pull/release operating function is achieved electronically.

The above-described devices either require practice to use reliably, are complex, and/or are expensive to manufacture and install.

Another device for increasing the rate of semiautomatic fire is shown in U.S. Pat. Nos. 9,568,264; 9,816,772; and U.S. Pat. No. 9,939,221, issued to Thomas Allen Graves. The devices shown in these patents forcefully reset the trigger with rigid mechanical contact between the trigger member and the bolt as the action cycles. This invention, however, does not provide a “drop-in” solution for existing popular firearm platforms, like the AR15, AK47 variants, or the Ruger 10/22™. To adapt this invention to an AR-pattern firearm, for example, would require not only a modified fire control mechanism, but also a modified bolt carrier.

SUMMARY OF INVENTION

The present invention provides a semiautomatic trigger mechanism for increasing rate of fire that can be retrofitted into popular existing firearm platforms. In particular, this invention provides a trigger mechanism that can be used in AR-pattern firearms with an otherwise standard M16-pattern bolt carrier assembly. The present invention is particularly adaptable for construction as a “drop-in” replacement trigger module that only requires insertion of two assembly pins and the safety selector. In the disclosed embodiments, the normal resetting of the hammer, as the bolt or bolt carrier is cycled, causes the trigger to be forcibly reset by contact between the hammer and a surface of the trigger member. Once reset, movement of the trigger is blocked by a locking bar and cannot be pulled until the bolt has returned to battery, thus preventing “hammer follow” behind the bolt or bolt carrier.

Other aspects, features, benefits, and advantages of the present invention will become apparent to a person of skill in the art from the detailed description of various embodiments with reference to the accompanying drawing figures, all of which comprise part of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

Like reference numerals are used to indicate like parts throughout the various drawing figures; wherein;

FIG. 1 is an isometric view of a drop-in trigger module for an AR-pattern firearm according to one embodiment of the invention;

FIG. 2 is a partially cut-away view thereof;

FIG. 3 is a longitudinal section view showing the module of the embodiment installed in a typical AR15-pattern lower receiver in a cocked and ready to fire status with the bolt and bolt carrier in an in-battery position;

FIG. 4 is a similar view in which the trigger has been pulled and the hammer has fallen against a firing pin; and

FIG. 5 is a similar view showing the bolt carrier in a retracted position, forcing the hammer and trigger into a reset status.

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DETAILED DESCRIPTION

With reference to the drawing figures, this section describes particular embodiments and their detailed construction and operation. Throughout the specification, reference to “one embodiment,” “an embodiment,” or “some embodiments” means that a particular described feature, structure, or characteristic may be included in at least one embodiment. Thus, appearances of the phrases “in one embodiment,” “in an embodiment,” or “in some embodiments” in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the described features, structures, and characteristics may be combined in any suitable manner in one or more embodiments. In view of the disclosure herein, those skilled in the art will recognize that the various embodiments can be practiced without one or more of the specific details or with other methods, components, materials, or the like. In some instances, well-known structures, materials, or operations are not shown or not described in detail to avoid obscuring aspects of the embodiments.

Referring first to FIGS. 1 and 2, therein is shown at 10 a “drop-in” trigger module adapted for use in an AR-pattern firearm according to a first embodiment of the present invention. As used herein, “AR-pattern” firearm includes the semiautomatic versions of the AR10 and AR15 firearms and variants thereof of any caliber, including pistol caliber carbines or pistols using a blow-back bolt. While select fire (fully automatic capable) versions of this platform, such as the M16 and M4, are also AR-pattern firearms, this invention only relates to semiautomatic firearm actions. The concepts of this invention may be adaptable to other popular semiautomatic firearm platforms, such as the Ruger 10/22™ or AK-pattern variants.

The module 10 includes a frame or housing 12 that may be sized and shaped to fit within the internal fire control mechanism pocket of an AR-pattern lower receiver. It includes first and second pairs of aligned openings 14, 16 that are located to receive transverse pins (40, 36, respectively, shown in FIGS. 3-5) used in a standard AR-pattern trigger mechanism as pivot axes for the hammer and trigger member, respectively. The housing 12 includes left and right sidewalls 20, 22, which extend substantially vertically and parallel to one another in a laterally spaced-apart relationship. The sidewalls 20, 22 may be interconnected at the bottom of the housing 12 at the front by a crossmember 24.

A hammer 18 of ordinary (MIL-SPEC) AR-pattern shape and construction may be used. The illustrated hammer 18 may be standard in all respects and biased by a typical AR-pattern hammer spring (not shown).

A modified trigger member 26 may be sized to fit between the sidewalls 20, 22 of the housing 12 and may include a trigger blade portion 28 that extends downwardly. The trigger blade portion 28 is the part of the trigger member 26 contacted by a user's finger to actuate the trigger mechanism. The trigger blade portion 28 may be curved (shown) or straight, as desired. The trigger member 26 may pivot on a transverse pin 36 (not shown in FIGS. 1 and 2) that extends through aligned openings 16 in the sidewalls 20, 22 of the housing 12. The same pin 36 is aligned and positioned within aligned openings 47 of a lower receiver 50 to assemble the module 10 into a fire control mechanism pocket 49 of the lower receiver 50, as shown in FIGS. 3-5, for example. The modified trigger member 26 may have integral first and second contact surfaces 30, 32. Some part of the trigger member 26 includes contact surfaces for interaction with the hammer 18 and locking bar 62. For

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example, the trigger member 26 can include first and second upwardly extended rear contact surfaces 30, 32. The first contact surface 30 is positioned to interact, for example, with a tail portion 44 of the hammer 18 that extends rearwardly from a head part 42 of the hammer 18. The second contact surface 32 is positioned to interact with a locking bar 62. The contact surfaces may be integral to a specially formed trigger body or may be a separate insert (shown) that is made to closely fit and mate with a standard AR-pattern trigger member, held in place by the trigger pin 36, with no lost motion between the parts.

The hammer 18 may include bosses 34 coaxial with a transverse pivot pin opening 38 that receives an assembly/pivot pin 40 (not shown in FIGS. 1 and 2) through the first set of aligned openings 14 in the housing 12 (and through openings 51 in the firearm receiver, to position the trigger module 10 within the fire control mechanism pocket 49 of the lower receiver 50, as shown in FIGS. 3-5). The bosses 34 may fit between the sidewalls 20, 22 of the housing 12 to laterally position the hammer 18, or can be received in the openings 14 (if enlarged) so that the hammer 18 stays assembled with the module 10 when the hammer's pivot pin is removed and/or when the module 10 is not installed in a firearm receiver. The hammer 18 includes a head portion 42 and a tail portion 44. The hammer 18 also includes a sear catch 46 that engages the sear 48 on the trigger member 26, when cocked. The trigger and hammer pins 36, 40 provide pivot axes at locations (openings 47, 51, shown in FIGS. 3-5, for example) standard for an AR-pattern fire control mechanism. Although FIGS. 3-5 are a longitudinal section view and only show one of the aligned openings 47, 51, it is understood that a typical AR15-pattern lower receiver 50 includes second, corresponding and aligned openings 47, 51 in the half of the receiver 50 not shown).

Referring now also to FIG. 3, the trigger module 10 is shown installed in the fire control mechanism pocket 49 of an AR-pattern lower receiver 50. Other lower receiver parts not important to the present invention are well-known in the art and are omitted from all figures for clarity. As is well-known in the art, the bolt carrier assembly 52 (or blow-back bolt) would be carried by an upper receiver (not shown) and engage the breach of a barrel or barrel extension. As used herein, “bolt carrier” and “bolt carrier assembly” may be used interchangeably and include a blow-back type bolt used in pistol caliber carbine configurations of the AR-platform. The hammer 18 is shown in a cocked position and a bolt carrier assembly 52 is shown in an in-battery position. The sear 48 engages the sear catch 46 of the hammer 18.

The bolt carrier assembly 52 used with the embodiments of this invention can be an ordinary (mil-spec) M16-pattern bolt carrier assembly, whether operated by direct impingement or a gas piston system, that has a bottom cut position to engage an auto sear in a fully automatic configuration. The bottom cut creates an engagement surface 54 in a tail portion 56 of the bolt carrier body 58. This is distinct from a modified AR15 bolt carrier that is further cut-away so that engagement with an auto sear is impossible. The semi-automatic AR-pattern safety selector switch 60 may also be standard (MIL-SPEC) in all respects.

The trigger module of the present invention includes a trigger locking bar 62 carried on a frame 66 for pivotal movement on a transverse pivot pin 68. The frame 66 may be part of the module housing 12, if configured as a “drop-in” unit. An upper end of the locking bar 62 extends above the upper edge of the housing 12 and lower receiver 50 to be engaged by the engagement surface 54 of the bolt

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carrier body 58 when the bolt carrier assembly 52 is at or near its in-battery position (as shown in FIG. 3). Contact between the engagement surface 54 and upper end of the locking bar 62 causes the locking bar 62 to pivot into a first position (FIG. 3) against a biasing spring 70 and allows pivotal movement of the trigger member 26. If desired, the locking bar 62 may include a rearward extension 64 that serves as a means to limit the extent to which it can pivot toward the blocking position.

Referring now also to FIG. 4, when the safety selector 60 is in the “fire” position (as shown in all figures), finger pressure pulling rearward against the trigger blade portion 28 causes the trigger member 26 to rotate on the pivot pin 36, as indicated by arrows. This rotation causes the sear 48 to disengage from the sear catch 46 of the hammer 18. This release allows the hammer 18 to rotate by spring force (hammer spring omitted for clarity) into contact with the firing pin 72. Any contact between the rear portion of the trigger member 26 and front surface of the locking bar 62 will simply cause the locking bar 62 to rotate out of the way, as illustrated in FIG. 4.

Referring now to FIG. 5, discharging an ammunition cartridge (not shown) causes the action to cycle by moving the bolt carrier assembly 52 rearwardly, as illustrated. The same effect occurs when the action is cycled manually. As in an ordinary AR15-pattern configuration, a lower surface 76 of the bolt carrier body 58 pushes rearwardly against the head portion 42 of the hammer 18, forcing it to pivot on the hammer pivot/assembly pin 40 against its spring (not shown) toward a reset position. As the rearward movement of the bolt carrier body 58 and pivotal movement of the hammer 18 continues, mechanical interference or contact between a rear surface 74 of the hammer 18 (such as on the tail portion 44) and a contact surface 30 of the trigger member 26 forces the trigger to pivot (arrows in FIG. 5) toward and to its reset position. At the same time, as the trigger member 26 is reset, the biasing spring 70 moves the lower end of the locking bar 62 into a second position (FIG. 5) in which it blocks pivotal movement of the trigger 26, including by finger pressure applied (or reapplied) to the trigger blade 28. Thus, as the bolt carrier assembly 52 returns forward, the trigger member 26 is held in its reset position by the locking bar 62 where the hammer sear catch 46 will engage with the sear 48 carried on the trigger member 26 to reset the fire control mechanism. The trigger member 26 cannot be pulled to release the sear/hammer engagement, thus precluding early hammer release or “hammer follow” against the bolt carrier assembly 52 and firing pin 72 as the bolt carrier assembly 52 is returning to battery. A trigger return spring (not shown) of the type used in a standard AR-pattern trigger mechanism may be unnecessary in this case, because the trigger member 26 is forced to return by the hammer 18, but may be used, if desired.

When the bolt carrier assembly 52 has reached (or nearly reached) its closed, in-battery position (shown in FIG. 3), the engagement surface 54 of the bolt carrier tail portion 56 contacts and forwardly displaces the upper end of the locking bar 62, disengaging the second contact surface 32 of the trigger member 26, allowing the trigger 26 to be pulled a second time. The distance of travel during which there is no interference between the locking bar 62 and second contact surface 32 of the trigger member 26, allowing the trigger member 26 to be manually displaced, may be about from about 0.10 to 0.31 inch. This prevents early release of the hammer 18 and contact of the hammer against the firing pin 72 before the bolt is completely locked and in-battery.

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Force applied by the user's trigger finger against the trigger blade portion 28 is incapable of overcoming the mechanical interference and force of the hammer 18 against the contact surface 30 of the trigger member 26. However, the trigger can immediately be pulled again—only by application of an external force—as soon as the locking bar 62 has been rotated against the spring 70 and out of blocking engagement with the trigger member 26, as the bolt carrier assembly 52 approaches or reaches its in-battery position. This allows the highest possible standard rate of fire, without risk of hammer-follow, for the semiautomatic action of the firearm.

While various embodiments of the present invention have been described in detail, it should be apparent that modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention. Therefore, the foregoing is intended only to be illustrative of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not intended to limit the invention to the exact construction and operation shown and described. Accordingly, all suitable modifications and equivalents may be included and considered to fall within the scope of the invention, defined by the following claim or claims.

What is claimed is:

1. For a firearm having a receiver with a fire control mechanism pocket, transversely aligned pairs of hammer and trigger pin openings in side walls of the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled, a trigger mechanism, comprising:
 - a hammer having a sear notch and mounted in the fire control mechanism pocket to pivot on a transverse hammer pin between set and released positions;
 - a trigger member having a sear and mounted in the fire control mechanism pocket to pivot on a transverse trigger pin between set and released positions, the trigger member having a surface positioned to be contacted by the hammer when the hammer is displaced by cycling of the bolt carrier, the contact causing the trigger member to be forced to the set position;
 - a locking bar pivotally mounted in a frame and spring biased toward a first position in which the locking bar mechanically blocks the trigger member from moving to the released position, and movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to the released position.
2. The trigger mechanism of claim 1, wherein the trigger member has a second surface positioned to be contacted by the locking bar when the locking bar is in the first position.
3. The trigger mechanism of claim 1, wherein the locking bar includes means for limiting the extent to which the locking bar can pivot by the spring bias toward the first position.
4. For a firearm having a receiver with a fire control mechanism pocket, assembly pin openings in side walls of the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled, a trigger mechanism, comprising:
 - a housing having transversely aligned pairs of openings for receiving hammer and trigger assembly pins;
 - a hammer having a sear notch and mounted in the housing to pivot on a transverse axis between set and released positions;
 - a trigger member having a sear and mounted in the housing to pivot on a transverse axis between set and

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released positions, the trigger member having a surface positioned to be contacted by the hammer when the hammer is displaced by the bolt carrier when cycled, the contact causing the trigger member to be forced to the set position;

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a locking bar pivotally mounted in the housing and spring biased toward a first position in which the locking bar mechanically blocks the trigger member from moving to the released position, and movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position in which the trigger member can be moved by an external force to the released position.

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5. The trigger mechanism of claim 4, wherein the trigger member has a second surface positioned to be contacted by the locking bar when the locking bar is in the first position.

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6. The trigger mechanism of claim 4, wherein the housing's transversely aligned pairs of openings for receiving hammer and trigger assembly pins are aligned with the assembly pin openings in the fire control mechanism pocket of the receiver.

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7. The trigger mechanism of claim 4, wherein the locking bar includes means for limiting the extent to which the locking bar can pivot by the spring bias toward the first position.

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* * * * *



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

~~Martinsburg~~, WV 25405

www.atf.gov

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907010: RKD
3311/307385

[REDACTED]
Buda, Texas 78610

Dear Sir,

This is in reference to your submission and accompanying correspondence to, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), Firearms Technology Industry Services Branch (FTISB), accompanied by an AR-15 type rifle equipped with what is described as the [REDACTED] AR1 trigger system (see enclosed photos). Specifically, you requested an examination and classification of this sample with regard to the amended Gun Control Act of 1968 (GCA) and the National Firearms Act (NFA).

As you know, the National Firearms Act (NFA), 26 U.S.C. § 5845(b), defines the term “**machinegun**” as—

...any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot, without manual reloading, by a single function of the trigger. The term shall also include the frame or receiver of any such weapon, any part designed and intended solely and exclusively, or combination of parts designed and intended, for use in converting a weapon into a machinegun, and any combination of parts from which a machinegun can be assembled if such parts are in the possession or under the control of a person.

As specified in the GCA, 18 U.S.C. § 921(a)(23), the term “machinegun” has “*the meaning given such term in section 5845(b) of the National Firearms Act (26 U.S.C. 5845(b))*.”

The submitted [REDACTED] AR1, is described as a “trigger-finger reset device”. You further describe the design and function of the device by explaining that “this trigger system works by mechanically pushing the trigger rapidly forward, resetting the finger and trigger to the forward”

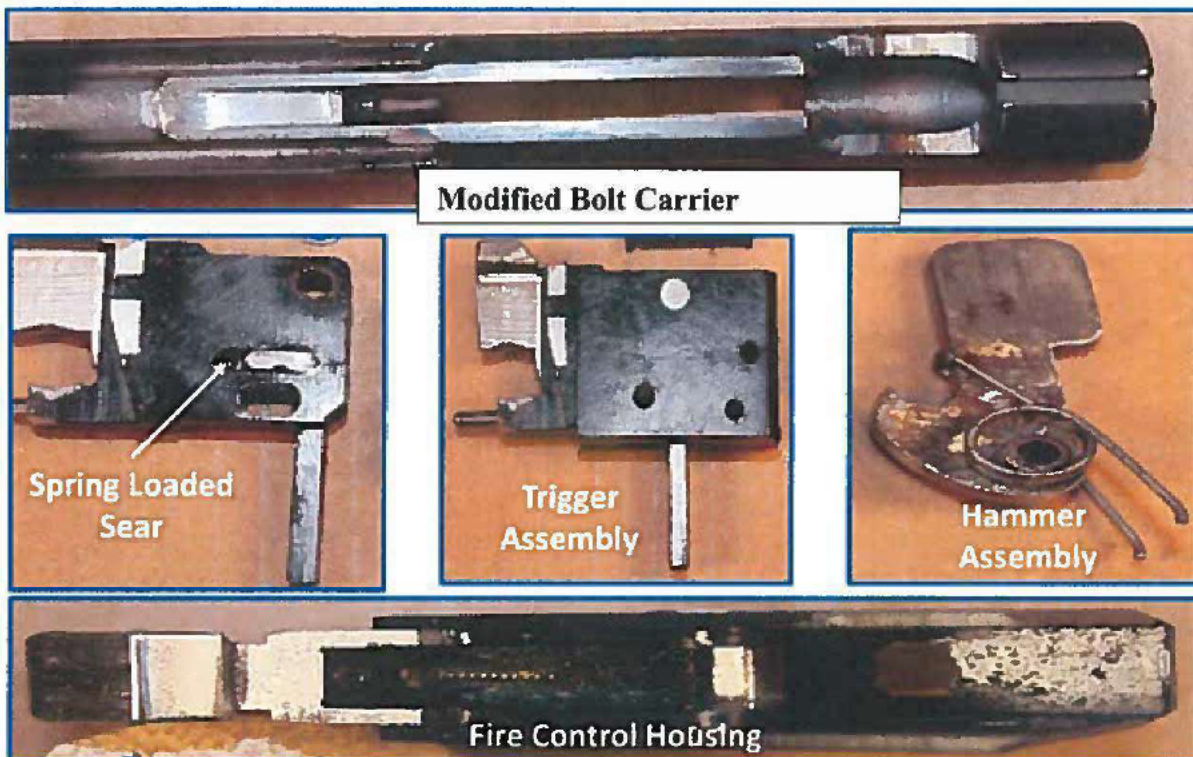
ATF0147

position. This allows the user to make a decision in which they leave rearward pressure off the trigger to stop the firing sequence, or re-engage rearward pressure on the trigger to continue the firing sequence." As a part of this description, you note that all of the components of the [REDACTED] ARI trigger are newly designed and include a bolt, housing, trigger, hammer, sear, springs and pins. FTISB notes that US Patent 9568264 (Flex-fire technology) covers the device, which is described as a technology to provide the potential of increasing both the rate of fire and the precision of fire at higher rates beyond the fundamental design capabilities of pre-existing semi-automatic arms.

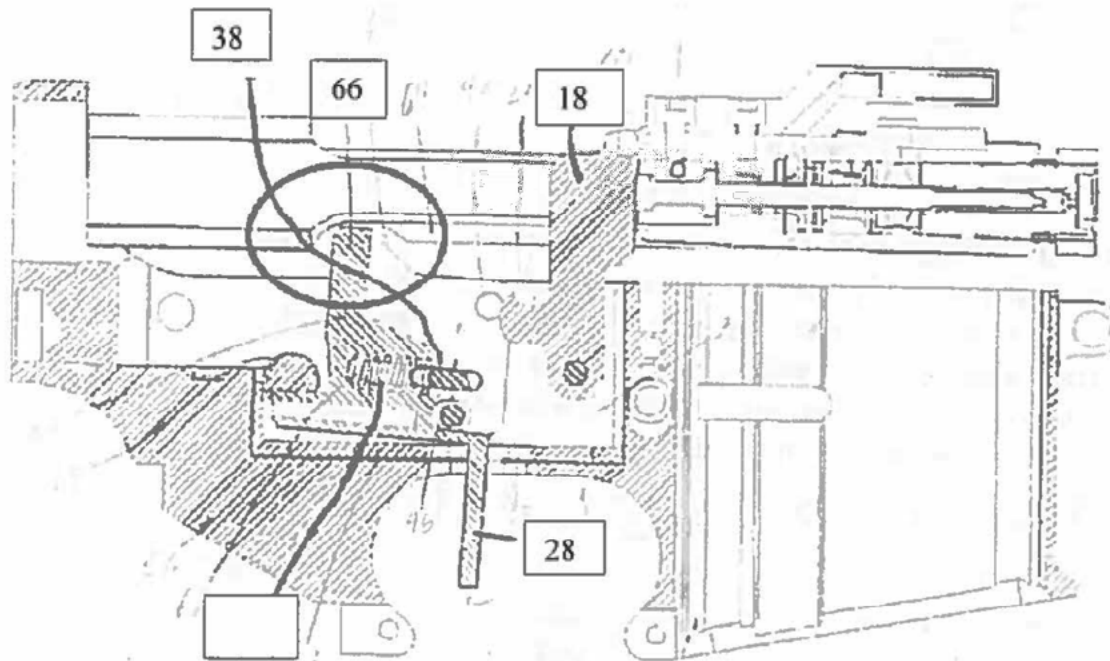
Also, your correspondence notes that ATF has previously interpreted the phrase "single function of the trigger" to mean a single movement of the trigger, whether that movement is the pull of the trigger or the release of the trigger and it is your opinion that this device submitted is only a trigger reset device and not a "machinegun" as defined.

The sample examined by FTISB personnel consists of a Colt Competition .223/5.56 caliber AR-15 pattern rifle, serial number CCR012176, which is equipped with the following items:

- Modified bolt carrier.
- Newly constructed hammer assembly.
- Newly constructed fire control housing.
- Newly constructed trigger assembly having steel block mounted on rear of assembly.
- Newly constructed spring loaded sear assembly.
- Miscellaneous retaining axles/screws, plungers/springs.



Provided illustration of [REDACTED] AR1 Trigger Device.



This illustration depicts how the parts interact.

No. 66 is the extension of the trigger that rests in the bolt cam.

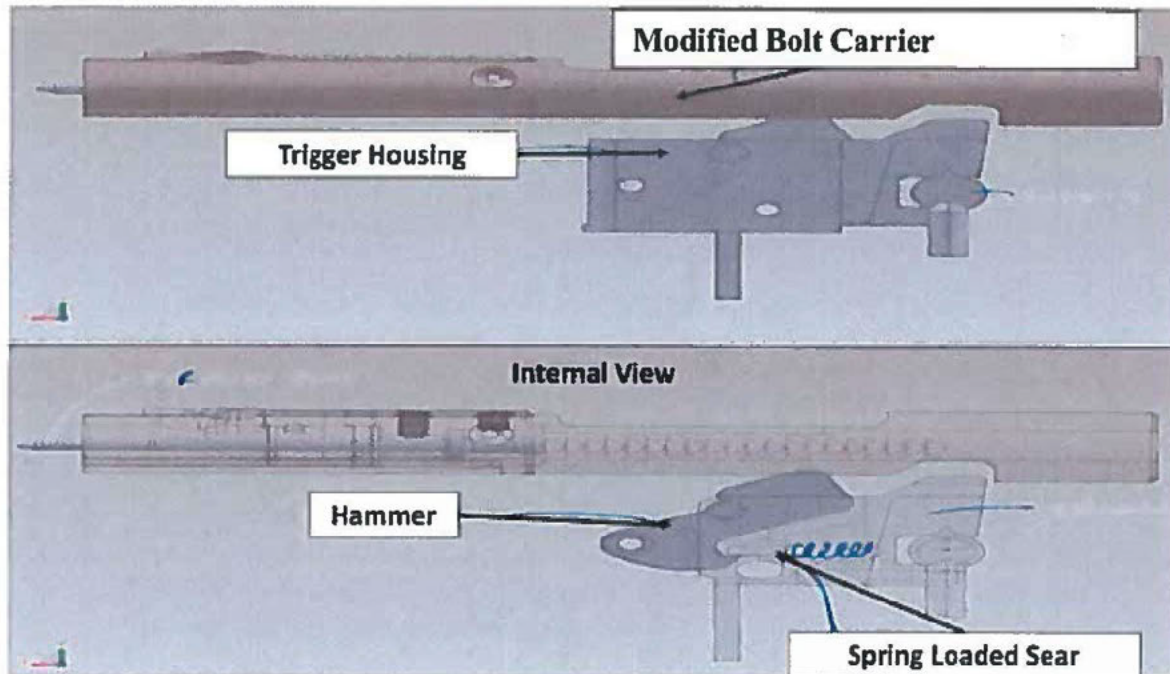
No. 28 is the portion of the trigger that interacts with the user's finger.

No. 38 is the spring loaded sear.

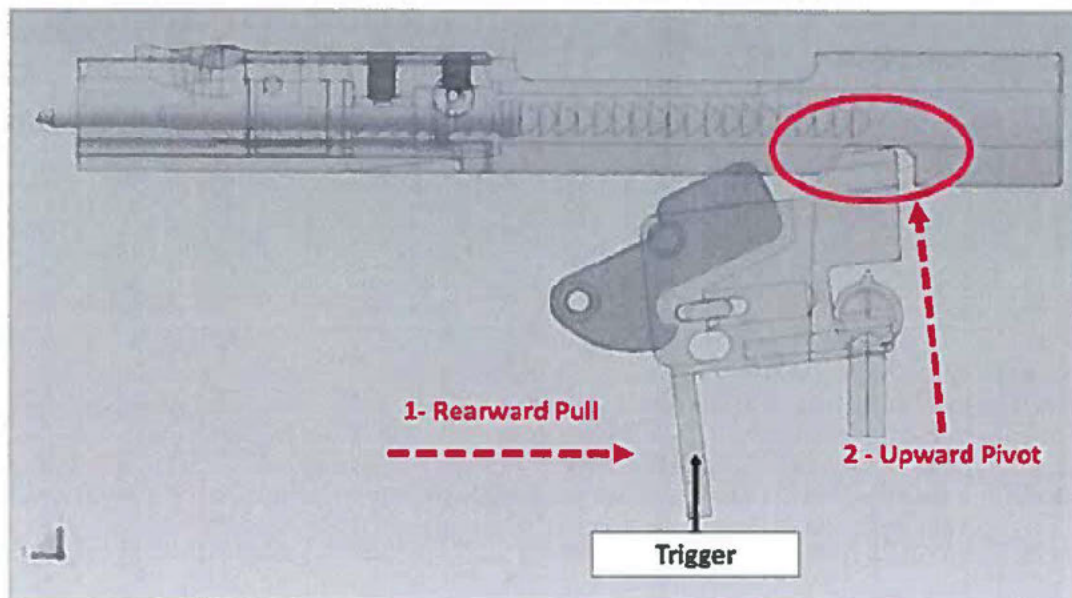
No. 18 is the hammer.

The written correspondence received from [REDACTED] LLC with the sample, provided the following statements and pictures offering a description of how the device differed in function from that of a standard unmodified AR-15 pattern rifle [Note: FTISB updated the pictures relevant to FTISB's analysis of the [REDACTED] AR1]:

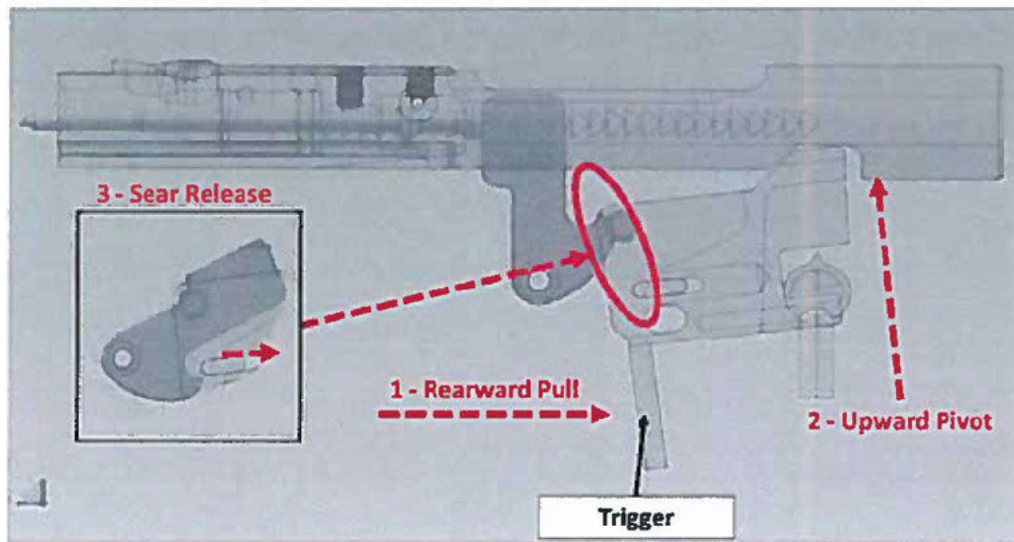
"We start with the trigger in the forward position and the hammer in the cocked position, with the bolt in battery."



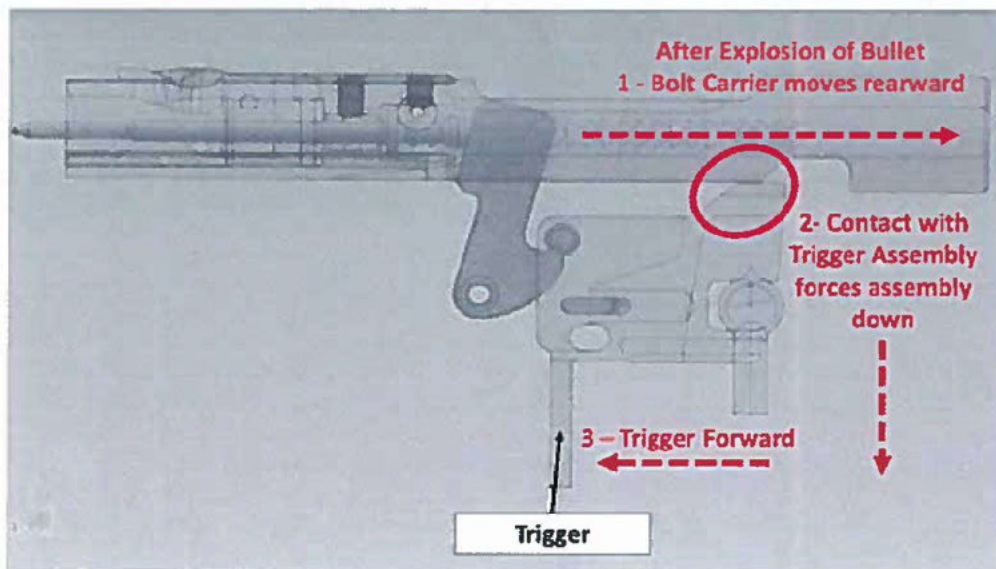
"When the trigger is pulled rearward it also pivots upward into an open space in the bolt."



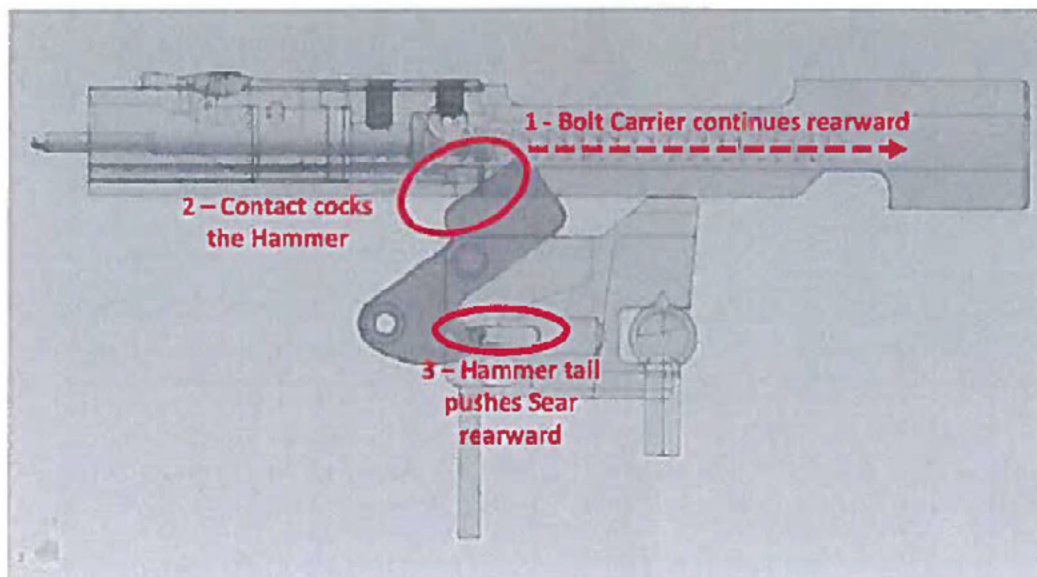
"As the trigger pivots back and up into the open space in the bolt, the sliding sear surface in the trigger separates from the tail of the hammer and the hammer releases and fires a round."



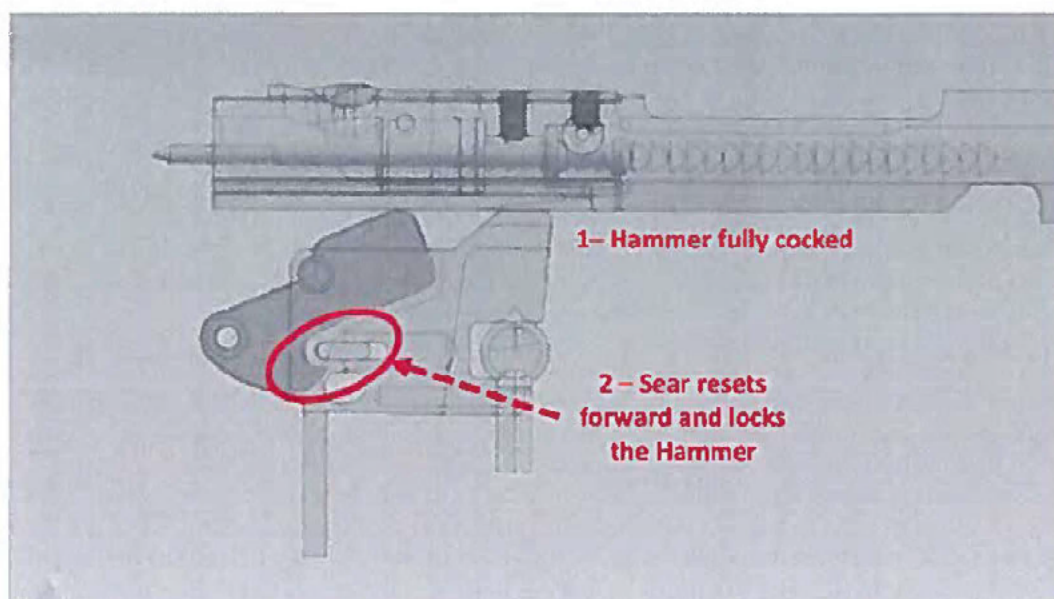
"The explosion of the bullet causes the bolt to move in a rearward direction. As the bolt moves rearward it contacts the top of the trigger and forces the tip of the trigger down, pivoting the blade of the trigger to the forward (reset) position."



"At this point the trigger is in the forward (un-pulled) position. The bolt continues rearward cocking the hammer, which moves the integrated trigger sear rearward". [We note that the shooter maintains a constant rearward pull on the trigger and the internal mechanism automatically forces the individual's finger/trigger forward instead of requiring that the shooter release the trigger.]

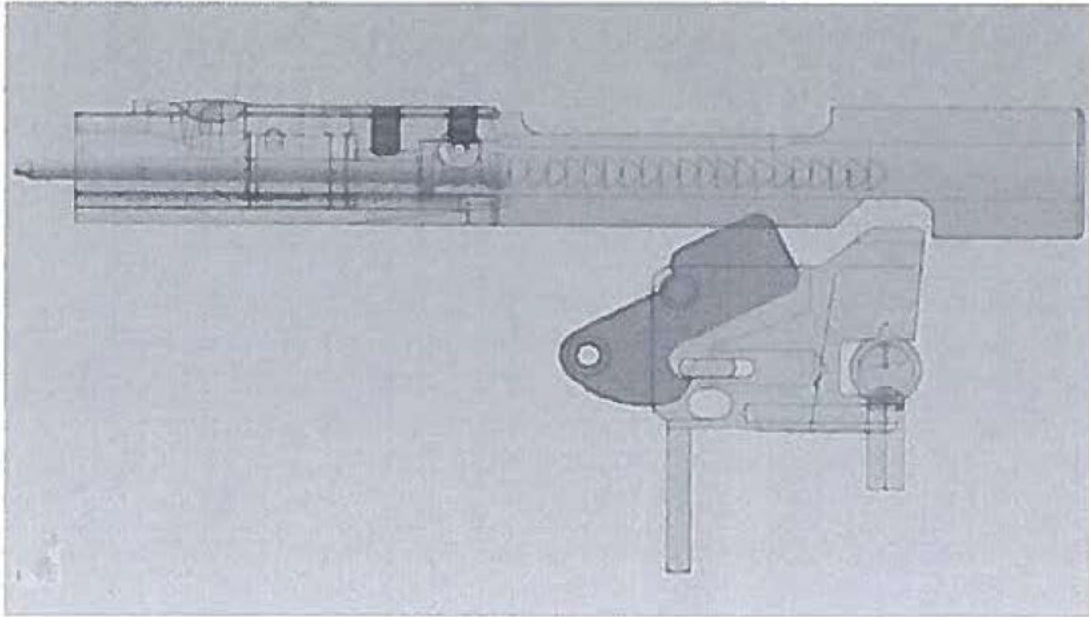


"At the rear of the bolt's stroke the hammer is cocked and the trigger sear is forced forward into a reset position (by spring pressure), locking the hammer in the cocked position."



"The bolt returns to battery and the hammer is now cocked against the trigger ready to fire the next round".

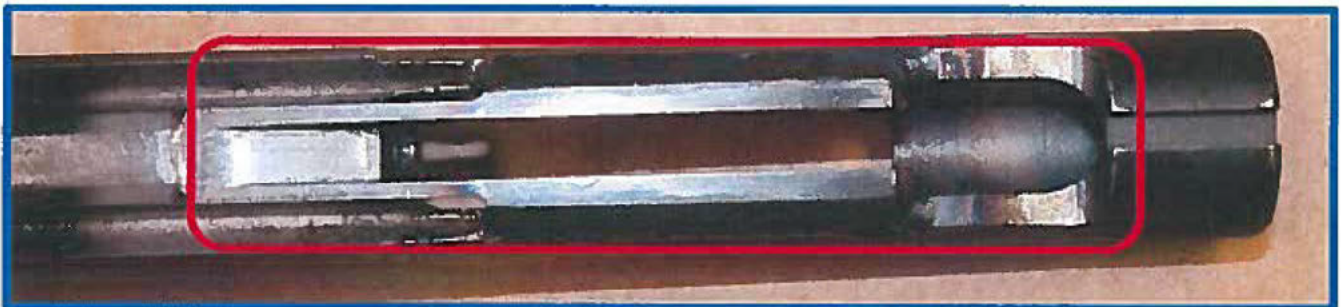
As explained below, a single constant rearward pull will cause the firearm to fire until the trigger is released, the firearm malfunctions, or the firearm exhausts its ammunition supply.



Submitted Sample Rifle



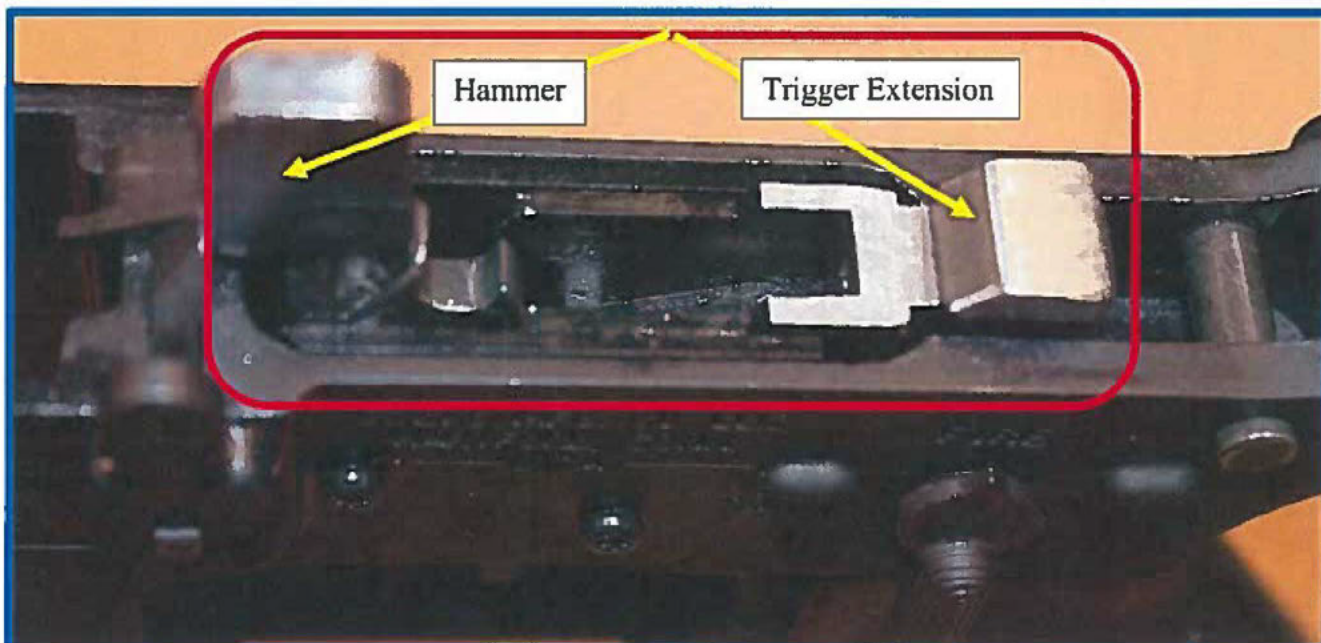
Sample modified bolt carrier showing added contact surface that interfaces with trigger.



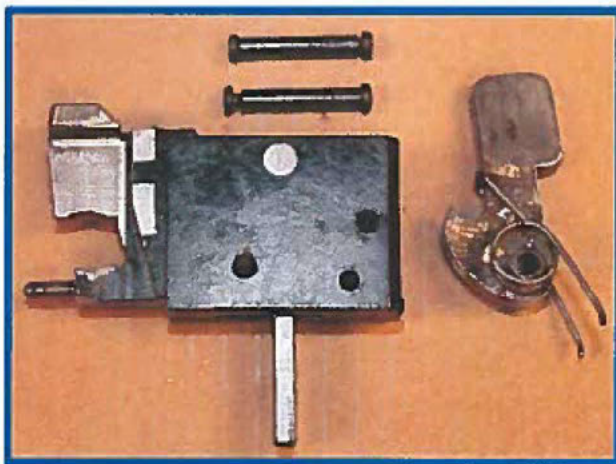
FTCB exemplar standard bolt carrier.



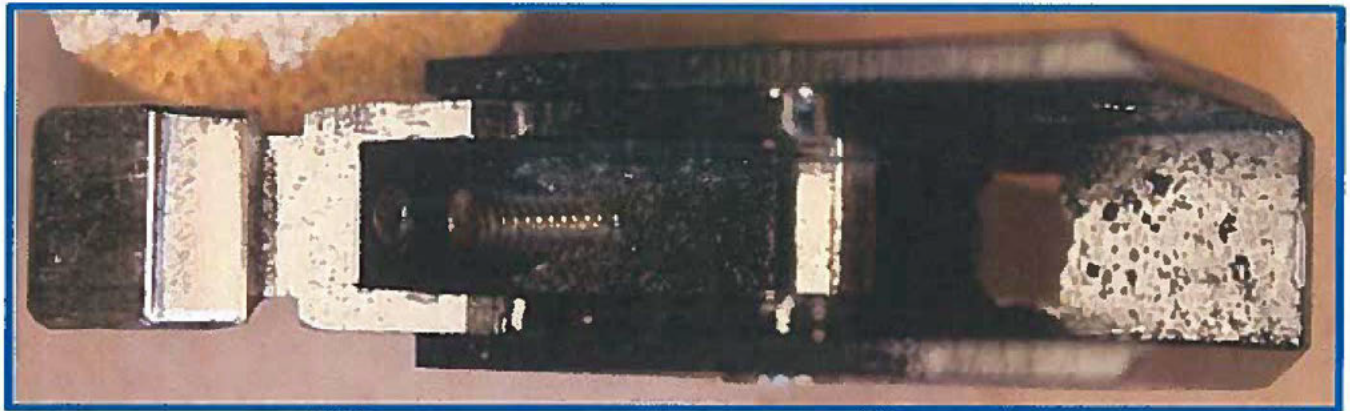
Internal View - Sample fire control mechanism (installed).



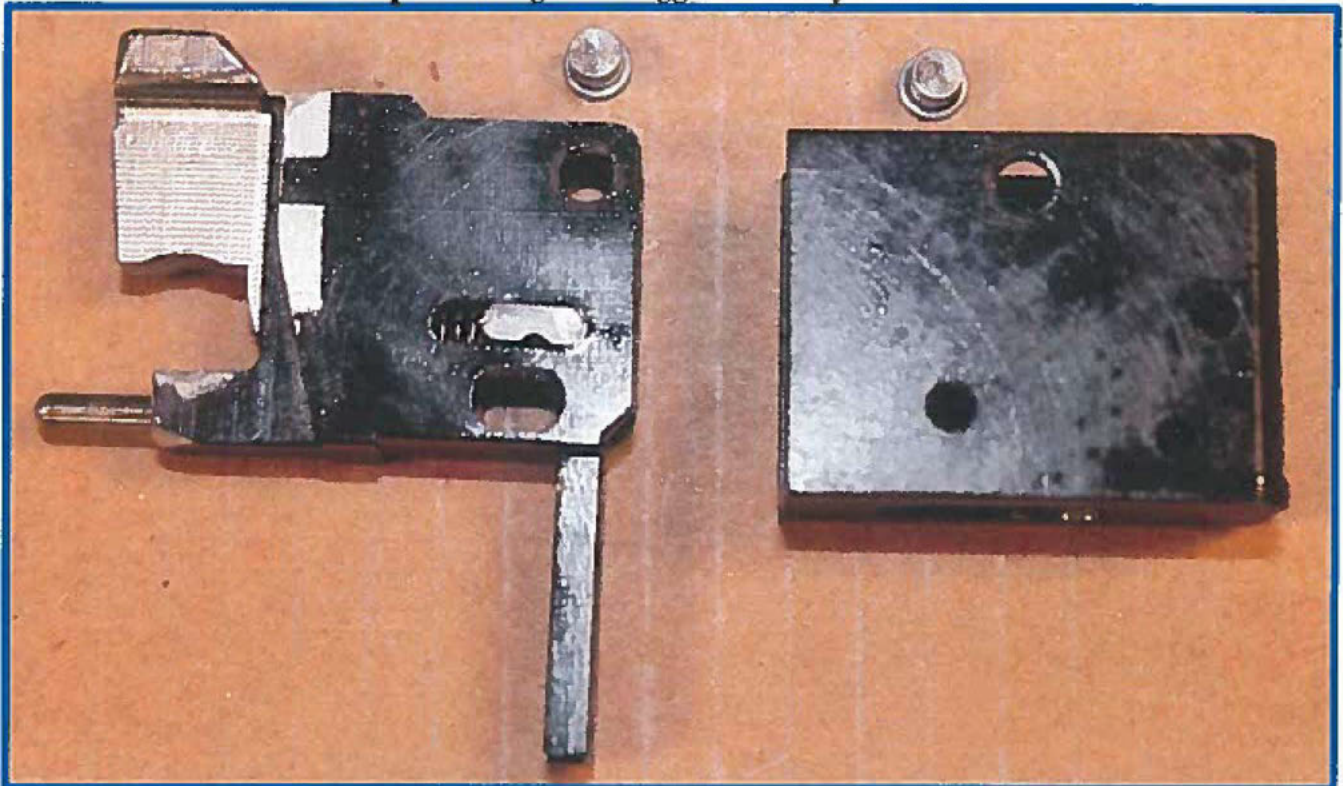
Sample fire control mechanism with the bolt carrier removed from firearm.



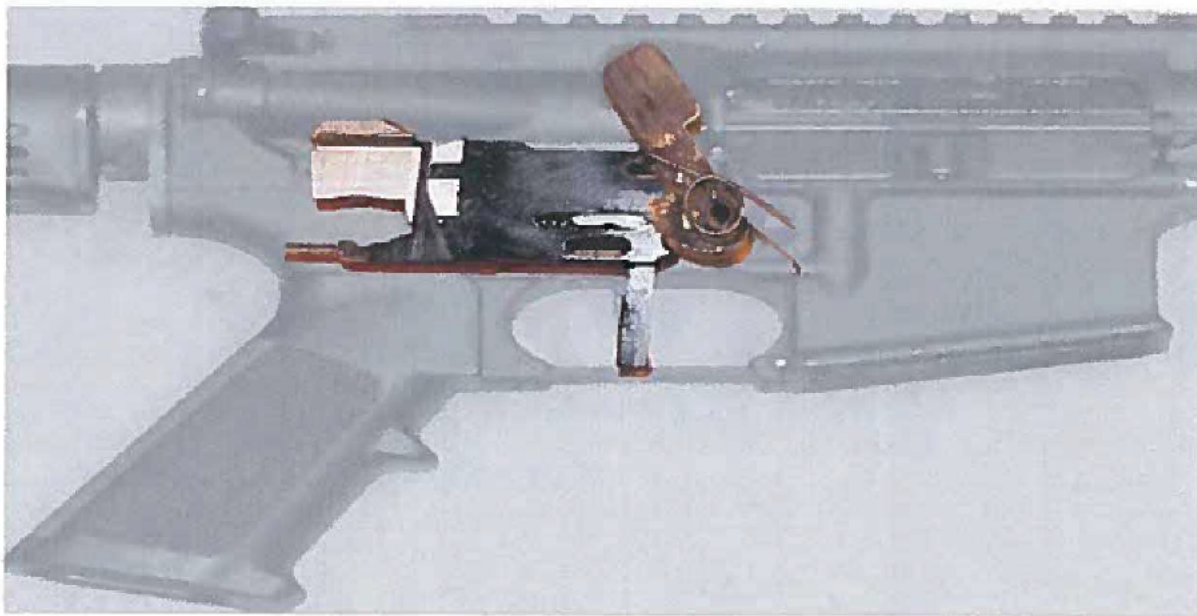
Overhead view of fire control mechanism



Sample housing with trigger assembly removed.



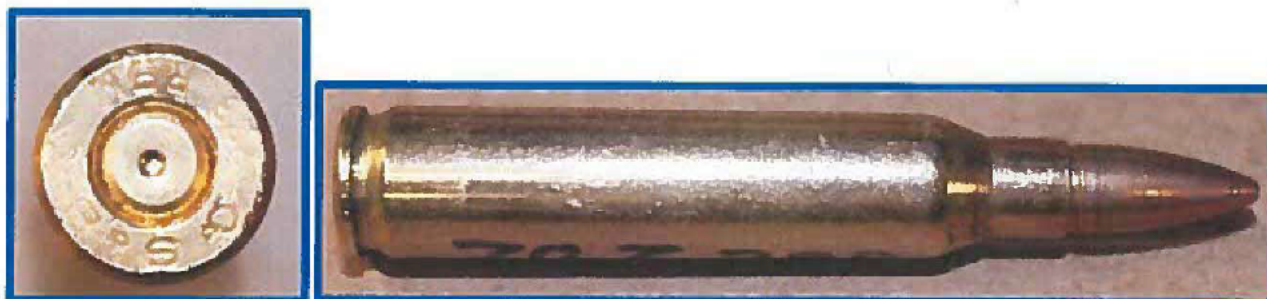
Sample [REDACTED] AR1 fire control mechanism installed in AR-15 type firearm.



As a part of this examination, FTISB conducted initial manual field-testing of the sample. The field test revealed that when the trigger was pulled with sufficient force to release the hammer, and the shooter maintains constant pressure on the trigger, the firearm expelled a projectile, extracted and ejected the casing, loaded another round, and fired. This continued until the trigger was released. A test fire with live ammunition resulted in the firearm shooting automatically more than one shot, without manual reloading, by a single function of the trigger.

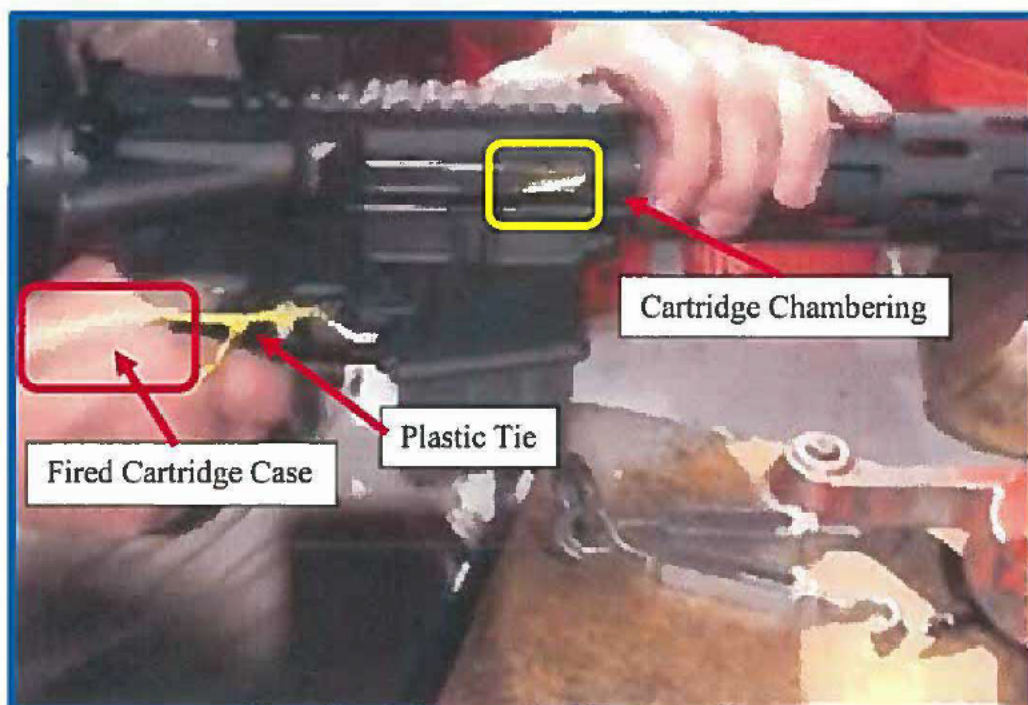
Additionally, during the finger activated firing sequences (with the trigger finger retained in a constant position), after firing several cartridges the sear failed to retain the hammer, which simply followed the bolt forward leaving a substantial firing pin mark on the primer of the chambered cartridge without firing the cartridge.

Photo of FTISB test cartridge removed from sample after hammer follow incident.



In order to demonstrate the sample fired more than one shot, without manual reloading, with a single function of the trigger, rather than firing a single shot with each function of the trigger, the following procedure was followed.

- A common 8-inch zip-tie was installed around the rear of the grip and the front of the sample's trigger.
- The zip-tie was gradually tightened until the trigger was retracted just enough to release the hammer.
- With the trigger retained in this position, the bolt assembly was retracted and retained in an open position, with the aid of the bolt catch.
- A ten-round ammunition load was placed into the sample's magazine, and the magazine was inserted into the firearm.
- Without touching the trigger (which was being retained in a fixed position by the plastic zip-tie), the bolt catch was depressed allowing the firearms bolt to travel forward and chamber a cartridge. Upon chambering and firing the first cartridge, the weapon cycled and fired five cartridges automatically without the trigger being released. The sear also failed to retain the hammer on the 6th cartridge, but did not strike the primer with sufficient force to fire that cartridge, thereby stopping the firing sequence.
- This same test was repeated several times with the sample firing from three to ten cartridges with a single function of the trigger before a malfunction was encountered or the ammunition load expended.



The previous still image extracted from a video of the FTISB test fire shows cartridge chambering in the yellow box and one of the ejected cartridges in the red box. Note that additional ejected cartridge cases are out of frame and trigger is retained with zip-tie and not in contact with finger.

Federal law defines “machinegun,” in relevant part, as “any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot, without manual reloading, by a single function of the trigger” as well as a “combination of parts designed and intended, for use in converting a weapon into a machinegun.” Legislative history for the NFA indicates that the drafters equated a “single function of the trigger” with “single pull of the trigger.” National Firearms Act: Hearings Before the Comm. on Ways and Means, House of Representatives, Second Session on H.R. 9066, 73rd Cong., at 40 (1934). Therefore, as you note, ATF has long held that a single function of the trigger is a “single pull” or alternatively, a single release of a trigger. Therefore, a firearm is not a machinegun if a projectile is expelled when the trigger is pulled and a second projectile is expelled when the trigger is released.

As stated above, your own description of the [REDACTED] AR1 trigger system includes the following statements, “*this trigger system works by mechanically pushing the trigger rapidly forward, resetting the finger and trigger to the forward position. This allows the user to make a decision in which they leave rearward pressure off the trigger to stop the firing sequence, or re-engage rearward pressure on the trigger to continue the firing sequence.*”

Federal courts have noted that automatically means that the weapon “fires repeatedly with a single pull of the trigger.” *Staples v. United States*, 511 U.S. 600, 602 n. 1 (1994). “That is, once its trigger is depressed, the weapon will automatically continue to fire until its trigger is released or the ammunition is exhausted.” *Id.* Courts have specifically affirmed ATF’s interpretation that a single act of the shooter to initiate the firing sequence is a single function of the trigger. *Akins v. United States*, 312 F. App’x 197, 200 (11th Cir. 2009); *Freedom Ordnance Mfg., Inc. v. Brandon*, No. 3:16-cv-00243-RLY-MPB (S.D. Ind. Mar. 27, 2018). *United States v. Fleischli*, 305 F.3d 643, 655 (7th Cir. 2002)(in which electronic switch was the trigger when it served to initiate the firing sequence and the minigun continued to fire until the switch was turned off or the ammunition was exhausted). In the *Freedom Ordnance* case, the United States District Court of Indiana confirmed that ATF was not arbitrary and capricious in the classification of an “electronic reset assist device” as a machinegun even though the firearm’s trigger reset before each shot by pushing the shooter’s finger forward. *Freedom Ordnance Mfg., Inc.*, No. 3:16-cv-00243-RLY-MPB. In these cases, a firearm is a machinegun when an internal mechanism or operation automatically forces the individual’s finger forward instead of requiring that the shooter release the trigger.

FTISB testing indicated that continuous rearward pressure after the initial pull of the trigger initiates a “firing sequence” which discharges multiple rounds with a single function of the trigger. A device with a trigger that is mechanically forced forward during a cycle of operation or firing sequence, which results in more than one round being fired with a “single function of a trigger,” is a machinegun. This type of operation is distinguishable from firearms that have not been classified as machineguns, including those that fire one round when the trigger is manually pulled and one round when the trigger is manually released.

The [REDACTED] AR1 is a device which is designed to assist in preventing the hammer from positively resetting (requiring that the shooter release the trigger in order to fire the next round) and causes a firearm to shoot automatically more than one shot, without manual reloading, by a single function of the trigger. This device is a combination of parts designed and intended, solely and exclusively, for use in converting a weapon into a machinegun; thus a "machinegun" as defined in 26 U.S.C. § 5845(b).

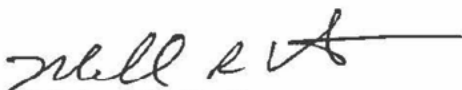
Additionally, note that on several occasions during the testing of this device, the hammer was found to have followed the bolt into battery as it chambered a cartridge. FTISB has also evaluated similar devices, which have prevented the trigger from positively resetting and resulted in such a "hammer-follow" scenario. A device designed to prevent the hammer from positively resetting could cause a firearm to shoot automatically more than one shot, without manual reloading, by a single function of the trigger, and would also be classified as a combination of parts designed and intended, solely and exclusively, for use in converting a weapon into a machinegun; thus a "machinegun" as defined in 26 U.S.C. 5845(b).

Consequently, the submitted sample [REDACTED] AR1 trigger assembly equipped firearm is a "machinegun" as defined in the NFA, and is subject to all NFA provisions. In addition, the sample [REDACTED] AR1 trigger assembly parts are a combination of parts designed and intended, for use in converting a weapon into a machinegun, and as such, in and of themselves, would be defined as a "machinegun" and subject to all NFA provisions.

The GCA prohibits the possession or transfer of any machinegun manufactured after May 19, 1986 with the limited exceptions of transfers to or by the government, and possession under the authority of the government. *See* 18 U.S.C. § 922(o). Based on these exceptions, Type 07 (manufacturer) and Type 08 (importer) Federal firearms licensees to manufacture or import firearms after May 19, 1986 for sale or distribution to the government. Because you are a 07/02 FFL/SOT, ATF will return the [REDACTED] AR1 trigger device equipped firearm upon receipt of a prepaid common carrier shipping label or FedEx shipping account billing number. Please be advised that the firearm/device will need to be properly marked, and an ATF Form 2 submitted by the close of the following business day that you receive the sample.

We thank you for your inquiry and trust that the foregoing has been responsive.

Sincerely yours,



Michael R. Curtis

Chief, Firearms Technology Industry Services Branch

cc: Rick Vasquez Firearms LLC

ATF0159

UPS

Shipped from:



Rick Vasquez Firearms LLC
235 Deer Creek Road
Winchester VA 22602

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Buda, TX 78610
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EVAL.

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The Wolf Tactical AR1 trigger system is being submitted for evaluation as a trigger-finger reset device. This trigger system works by mechanically pushing the trigger rapidly forward, resetting the finger and trigger to the forward position. This allows the user to make a decision in which they leave rearward pressure off the trigger to stop the firing sequence, or re-engage rearward pressure on the trigger to continue the firing sequence. It is our opinion that this device submitted is only a trigger reset device, nevertheless it has been submitted for your classification.

Definitions: COLT COMPETITION S/N: CCR 012176
AR-15

A firearm: 18 U.S.C. § 921(a)(3), the Gun Control Act of 1968 ("GCA") defines the term "firearm" to include "any weapon (including a starter gun) which will or is designed to or may be readily converted to expel a projectile by the action of an explosive, the frame or receiver of any such weapon..."

A machinegun: 26 U.S.C. § 5845(b), the National Firearms Act, Title II of the GCA ("NFA"), defines "machinegun" to include "any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot, without manual reloading, by a single function of the trigger. This term shall also include the frame or receiver of any such weapon, any part designed and intended solely and exclusively, or combination of parts designed and intended, for use in converting a weapon into a machinegun, and any combination of parts from which a machinegun can be assembled if such parts are in the possession or under the control of a person." (The mechanical function of the [REDACTED] AR1 trigger does not fall within the definition of "machinegun" under the NFA.)

ATF has previously interpreted the phrase "single function of the trigger" to mean a single movement of the trigger, whether that movement is the *pull* of the trigger or the *release* of the trigger. A trigger "functions" by causing the firing sequence to begin. This could be described as the release of a hammer or a striker.

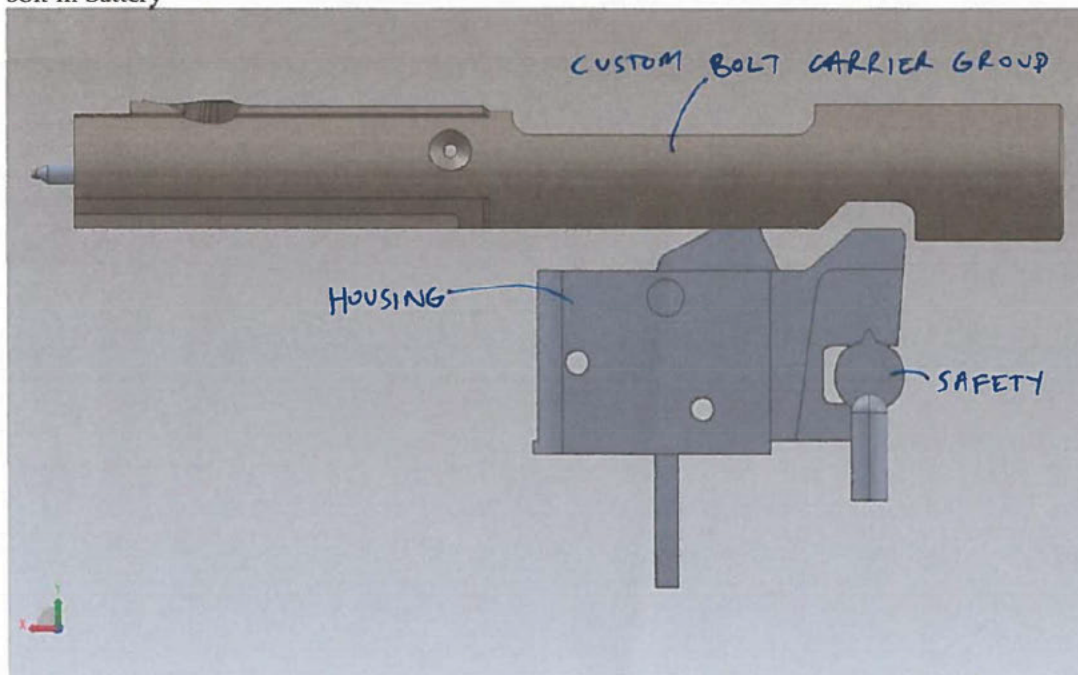
Consequently, if the firearm or device will allow more than one shot to fire when the trigger is pulled or when the trigger is released, then the firearm would have the capability to fire more than one shot by the single function of the trigger. This would make the firearm a machinegun as defined.

The [REDACTED] AR1 trigger is specifically designed to only fire a single round on each rearward movement of the trigger. All of the components of the [REDACTED] AR1 trigger are newly designed and include a bolt, housing, trigger, hammer, sear, springs and pins. These components interact in a manner which, upon pulling the trigger, the hammer is released from the sear firing a single round. In layman's terms, following is the firing sequence:

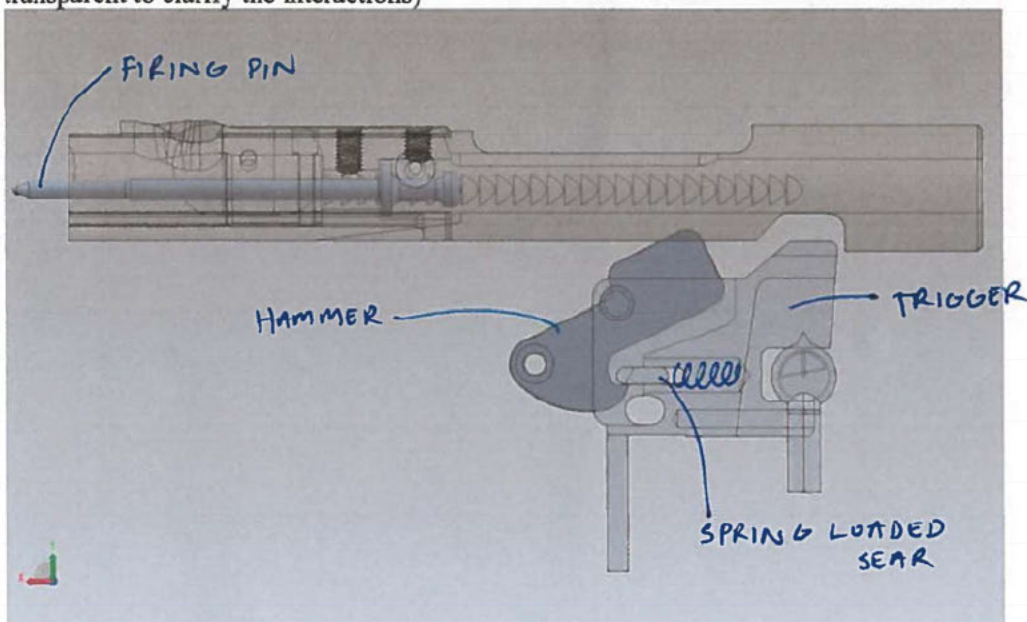
AR1 Trigger:

2

We start with the trigger in the forward position and the hammer in the cocked position, with the bolt in battery



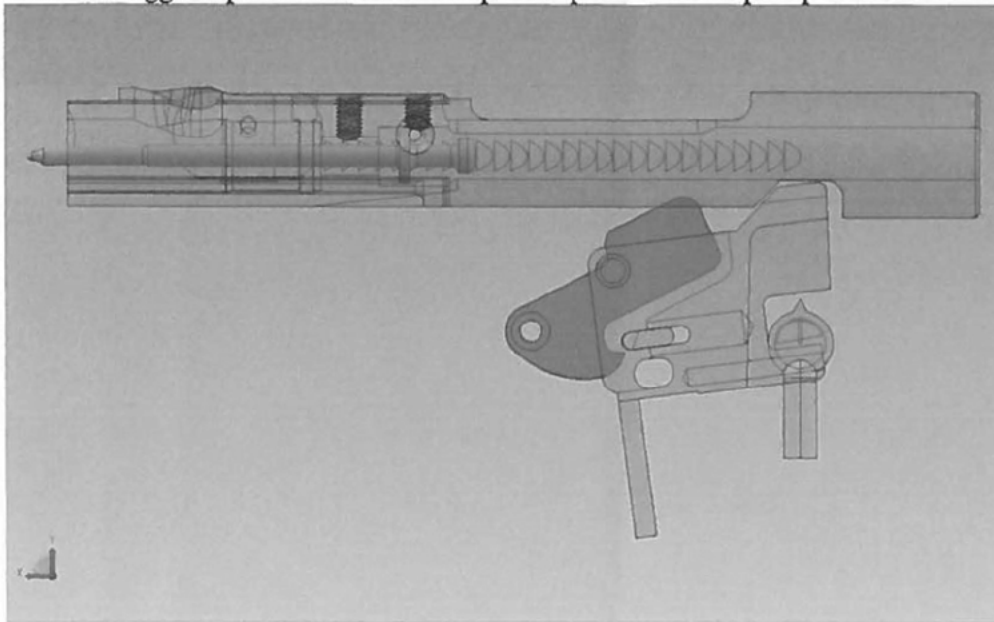
(In the rest of the images, not all parts are shown in all images and some are shown as transparent to clarify the interactions)



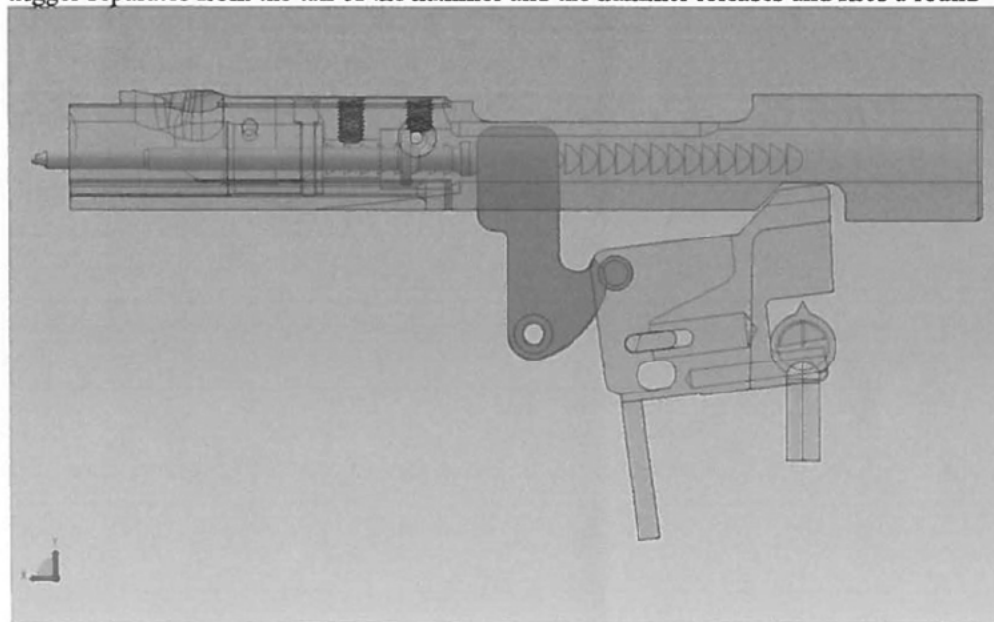
AR1 Trigger:

3

When the trigger is pulled rearward it also pivots upward into an open space in the bolt



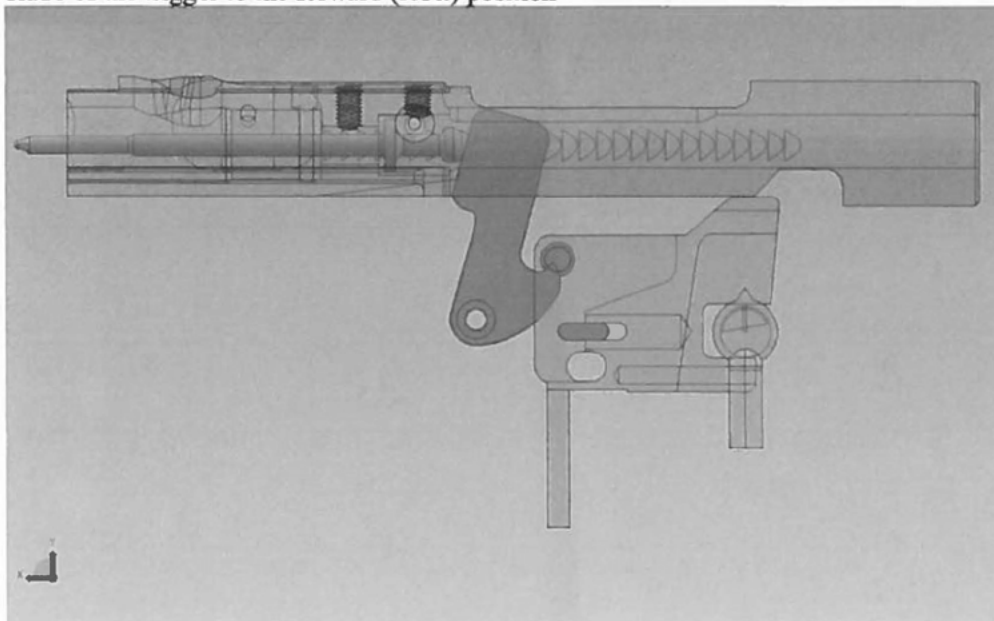
As the trigger pivots back and up into the open space in the bolt, the sliding sear surface in the trigger separates from the tail of the hammer and the hammer releases and fires a round



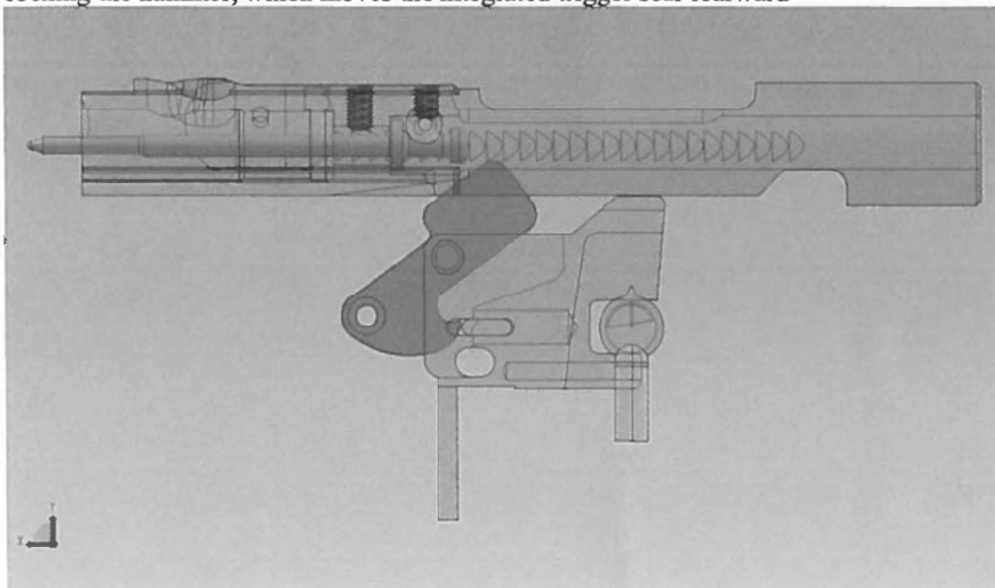
AR1 Trigger:

4

The explosion of the bullet causes the bolt to move in a rearward direction. As the bolt moves rearward it contacts the top of the trigger and forces the top of the trigger down, pivoting the blade of the trigger to the forward (reset) position



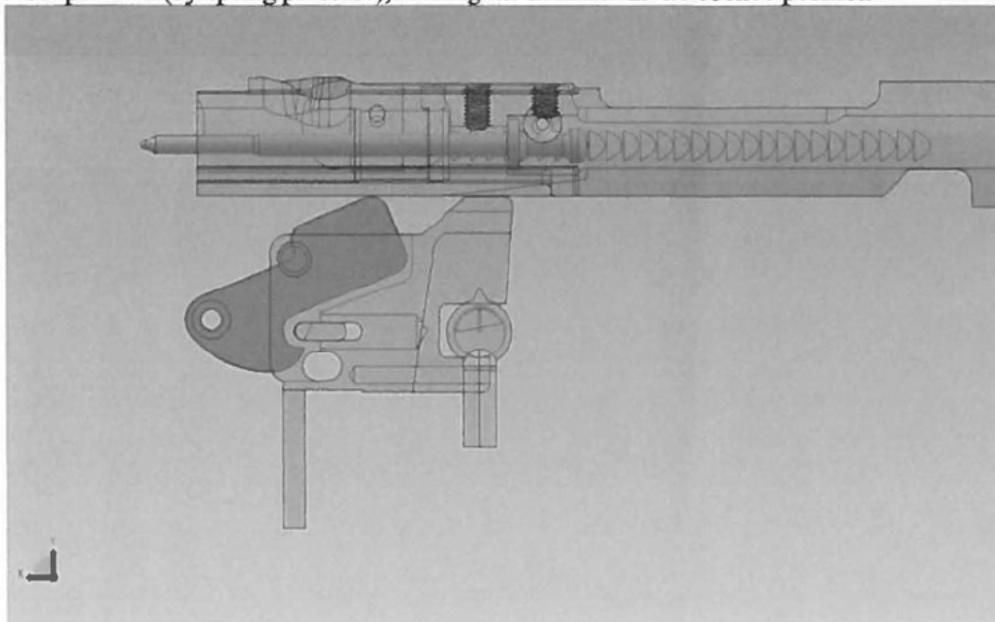
At this point the trigger is in the forward (unpulled) position. The bolt continues rearward cocking the hammer, which moves the integrated trigger sear rearward



AR1 Trigger:

5

At the rear of the bolt's stroke the hammer is cocked and the trigger sear is forced forward into a reset position (by spring pressure), locking the hammer in the cocked position



The bolt returns forward to battery and the hammer is now cocked against the trigger ready to fire the next round

